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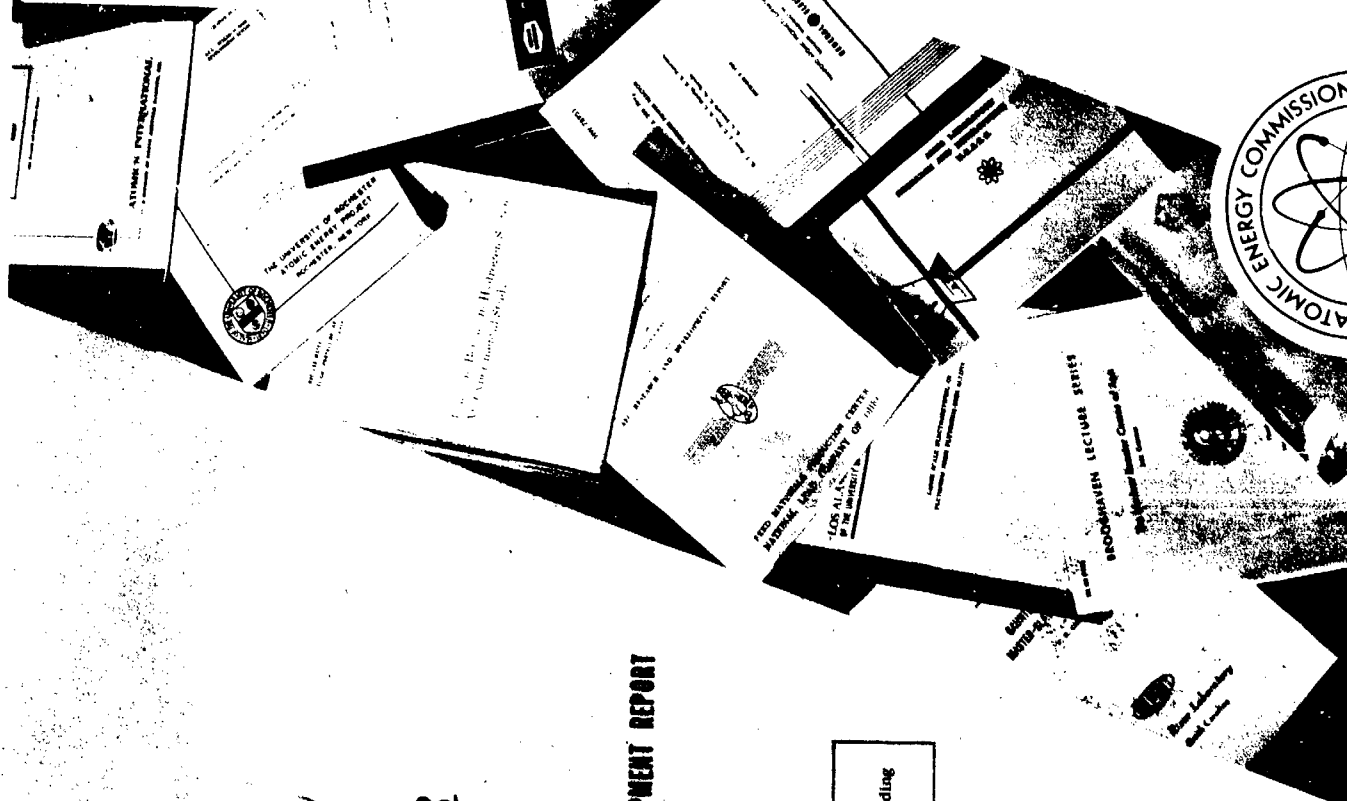
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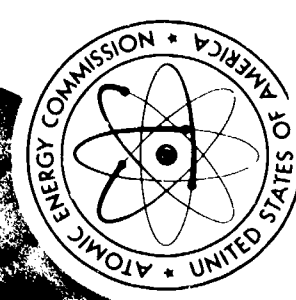
ATOMIC ENERGY COMMISSION  
RESEARCH AND DEVELOPMENT REPORT

THE OFFICE OF RESEARCH  
ATOMIC ENERGY COMMISSION  
WASHINGTON, D.C. 20545

RESEARCH AND DEVELOPMENT REPORT

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RESEARCH LECTURE  
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DEFENSE ATOMIC  
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# A Facsimile Report

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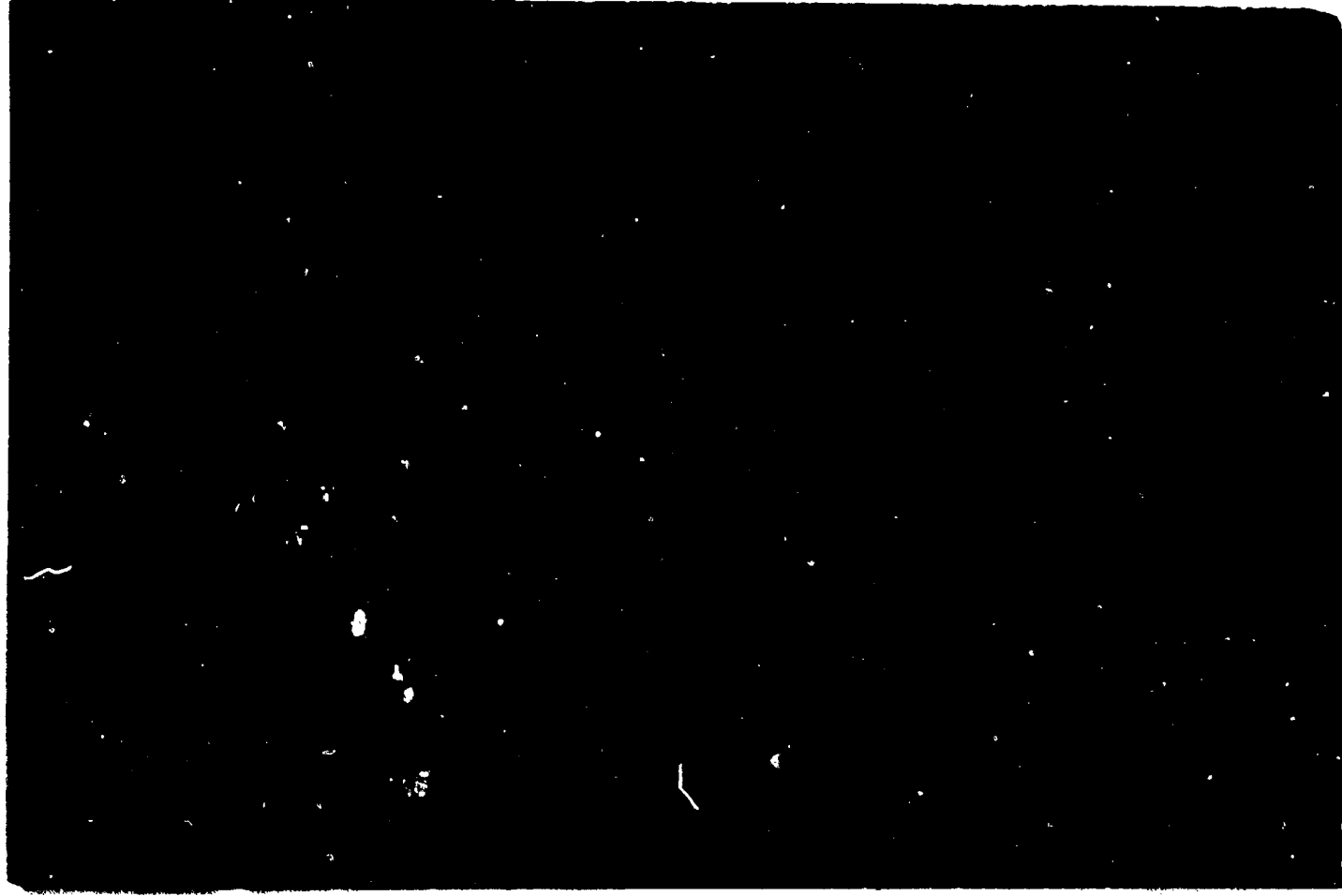
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U.S.S. YO 166

TEST ABLE

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**MAY 16 1964**

# OPERATION CROSSROADS.

# DIRECTOR OF SHIP MATERIAL

# JOINT TASK FORCE ONE

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BUREAU OF SHIPS GROUP

TECHNICAL INSPECTION REPORT

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Classification (Exempted) (Changed to  
By AUTHORITY OF JOINT CHIEFS OF STAFF JCS 1752/34 DATED 15 APRIL 1949  
By *[Signature]* Date MAY 16 1952

APPROVED:

F. X. Forest,  
Captain, U.S.N.

USS YO 160

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RESTRICTED  
ATOMIC ENERGY ACT 1946

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TECHNICAL INSPECTION REPORT

OVERALL SUMMARY

I. Target Condition After Test.

(a) Drafts after test, general areas of flooding, sources.

There was no flooding, hence no change in drafts or list.

(b) Structural damage.

HULL

The structure above the main deck is almost completely demolished. There is no significant damage below the main deck.

MACHINERY

No comment.

ELECTRICAL

This vessel received extensive structural damage on the main deck and above. The wooden bridge house and all equipment therein burned. Concrete deck houses had their bulkheads and overheads blown in. The wooden catwalk was demolished. This structural damage caused damage to electrical equipment mounted on or near the structure affected.

(c) Other damage.

HULL

Not observed.

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Classification (Controlled) (Changed to Security Information by Authority of Staff JCS 1795/58 DATED 16 APRIL 1968)  
By *John H. Hinkle* Date *MAY 16 1968*

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## MACHINERY

Nearly all of the machinery was wrecked by direct effect of the blast on exposed machinery, and heavy concrete blocks forming the overhead of machinery spaces. This concrete was broken loose by the blast and fell onto the machinery.

## ELECTRICAL

Practically all electrical equipment on this vessel was destroyed either by the fire or by the damage to structures. Ship's service diesel generator plant and all power and lighting circuits were damaged beyond repair. Motors and motor controllers were all wrecked beyond repair with the possible exception of the anchor windlass motor and master switch. Practically all lighting fixtures and lamps were demolished. Sound powered telephone circuits and most telephone equipment destroyed. Except for the breakage of indicator lights, the overflow fuel oil alarm indicating system appeared to be undamaged and capable of being operated if power was available.

## II. Forces Evidenced and Effects Noted.

### (a) Heat.

#### HULL

There is little evidence of heat other than that which caused the wooden bridge house and the compartments below to burn. Wood planking on the catwalk showed no charring.

## MACHINERY

The outside forward bulkhead of the poop deckhouse shows evidence of extreme heat and fire. Scorched and blistered paint on exposed surfaces evidence extreme heat from the direction of the blast.

## ELECTRICAL

Radiant heat from above and aft was evidenced by the USS YO160

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scorching of exposed surfaces. This radiant heat did no apparent damage directly to electrical equipment. It is considered, however, that this radiant heat started the fires on the vessel.

## (b) Fires and Explosions.

#### HULL

Fire completely burned the wooden bridge house and burned out the interior of several compartments below the poop deck. There were no explosions.

## MACHINERY

The poop deckhouse was gutted by fire.

## ELECTRICAL

The radiant heat started a fire aft which burned practically all inflammable material and equipment aft on the main deck and above. The areas burned included the vessels living and berthing spaces, steering engine room, engine room, wooden bridge and part of the catwalk. It is estimated that approximately 90% of the electrical equipment in these areas was destroyed by the fire. The equipment in which the original fire started is not evident since the entire area is so badly burned.

### (c) Shock.

#### HULL

None.

## MACHINERY

No evidence.

## ELECTRICAL

There was some evidence of shock to electrical

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equipment. This shock is considered to be mostly a secondary effect. It caused equipment mounted on structures to become missiles. When these missiles struck other equipment or structures the impact caused damage to the equipment hit or to equipment mounted on the structures. Effects of apparent shock were noted in broken phenolic parts of switches and cracked or broken cast iron parts.

(d) Pressure.

HULL

There is no pressure damage to the hull proper. Concrete superstructure which was badly damaged by blast has spalled and exposed the steel reinforcements. Items of equipment were, in general, damaged and torn loose from their moorings. In many cases the moorings tore away from the concrete.

MACHINERY

Very high blast pressure from starboard wrecked all exposed equipment and carried away some of it. The blast broke loose the thick concrete on the docks and overheads and it fell into spaces below, completely wrecking them.

ELECTRICAL

Air blast from above and aft is considered to be the primary cause of damage to this vessel. Even though the fire caused extensive damage, much of the equipment that was burned had previously been damaged by the blast. The blast in carrying away structures damaged the electrical equipment mounted on these structures.

(e) Effects peculiar to the Atom Bomb.

HULL

None.

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MACHINERY

The high blast pressure and extreme heat are apparently peculiar to the Atom Bomb.

ELECTRICAL

There were no effects noted that are considered peculiar to the Atomic Bomb other than radioactivity and the intensity of the heat wave.

III Results of Test on Target.

(a) Effect on machinery, electrical, and ship control.

HULL

The steering mechanism is operable but can be controlled only in the steering compartments.

MACHINERY

All machinery except the anchor windlass was completely wrecked and is considered to be beyond repair.

ELECTRICAL

The electric plant was almost completely destroyed. Almost all electrical equipment was damaged beyond practical repair. Ship's control was destroyed.

(b) Effect on gunnery and fire control.

HULL

The 20 MM gun foundations and bulwarks are

useless.

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**MACHINERY**

No comment.

**ELECTRICAL**

All gunnery and fire control was destroyed.

(c) Effect on watertight integrity and stability.

**HULL**

None.

**MACHINERY**

No comment.

**ELECTRICAL**

No comment.

(d) Effect on personnel and habitability.

**HULL**

Casualties to topside personnel from blast, heat, and radioactivity would have been extremely heavy. The test has rendered the craft uninhabitable.

**MACHINERY**

It is believed that if the crew had been aboard during the test all of them would have been killed. Habitability was reduced to practically zero.

**ELECTRICAL**

The effects of radioactivity on personnel and habitability are not known. Neglecting radioactivity there would have been no effect.

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Given very heavy personnel casualties due to the air blast, radiant heat and missiles. The ship was not habitable since all berthing and messing facilities were destroyed by fire.

(e) Effect on fighting efficiency.

**HULL**

There is no impairment of seaworthiness. However, the serviceability is practically destroyed by damage to the boiler and pump room equipment. The 20 MM gun foundations have been blown down so that if guns had been installed, they also would have been put out of action.

**MACHINERY**

The ability of the vessel to deliver fuel or lubricants is destroyed. Her capability as a storage tank does not appear to have been seriously impaired.

NOTE: This vessel has no propulsion machinery.

**ELECTRICAL**

This vessel could not perform its primary function which is handling its cargo of fuel oil. From an electrical standpoint the remaining utility of the vessel was zero.

IV. General Summary of Observers' Impressions and Conclusions.

**HULL**

The services of this vessel would be entirely lost with either permanent or jury rig machinery could be installed for handling the cargo.

For information see the detailed report prepared by the Bureau of Yards and Docks.

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## MACHINERY

In view of this vessel's close range during Test A her survival is noteworthy. Protected machinery might have remained operable if the decks and overheads of machinery spaces had been steel instead of concrete.

## ELECTRICAL

While electrical equipment was almost entirely destroyed by this test, most of the electrical damage was of a secondary nature having been caused by missiles due to concrete structures giving away and due to fires.

V. Preliminary General or Specific Recommendations of Inspection Group.

## HULL

None.

## MACHINERY

If additional concrete vessels are to be built, consideration should be given to use of steel for decks and overheads.

## ELECTRICAL

None.

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## TECHNICAL INSPECTION REPORT

### SECTION I - HULL

#### GENERAL SUMMARY OF HULL DAMAGE

##### I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

There was no flooding, hence no change in drafts or list.

(b) Structural damage.

The structure above the main deck is almost completely demolished. There is no significant damage below the main deck.

(c) Other damage.

Not observed.

##### II. Forces Evidenced and Effects Noted.

(a) Heat.

There is little evidence of heat other than that which caused the wooden bridge house and the compartments below to burn. Wood planking on the catwalk showed no charring.

(b) Fires and explosions.

Fire completely burned the wooden bridge house and burned out the interior of several compartments below the poop deck. There were no explosions.

(c) Shock.

None.

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(d) Pressure.

There is no pressure damage to the hull proper. Concrete superstructure which was badly damaged by blast has spalled and exposed the steel reinforcements. Items of equipment were, in general, damaged and torn loose from their moorings. In many cases the moorings tore away from the concrete.

(e) Effects peculiar to the Atom Bomb.

None.

III. Results of Test on Target.

(a) Effect on machinery, electrical, and ship control.

The steering mechanism is operable but can be controlled only in the steering compartments.

(b) Effect on gunnery and fire control.

The 20 MM gun foundations and bulwarks are useless.

(c) Effect on watertight integrity and stability.

None.

(d) Effect on personnel and habitability.

Casualties to topside personnel from blast, heat, and radioactivity would have been extremely heavy. The test has rendered the craft uninhabitable.

(e) Effect on fighting efficiency.

There is no impairment of seaworthiness. However, the serviceability is practically destroyed by damage to the boiler and pump room equipment. The 20 MM gun foundations have been blown down so that if guns had been installed, they also would have been put out of action.

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IV. General Summary of Observers' Impressions and Conclusions.

The services of this vessel would be entirely lost until either permanent or jury rig machinery could be installed for handling the cargo.

For further information see the detailed report prepared by the Bureau of Yards and Docks.

V. Preliminary Recommendations.

No comment.

VI. Instructions for Loading the Vessel Specified the Following:

| ITEM                            | LOADING   |
|---------------------------------|---|
| Fuel oil                        | No special adjustment required, except that no inflammable cargo shall be carried in the tanks. |
| Diesel oil                      | Tanks may be ballasted with sea water to adjust trim, number and list.                          |
| Ammunition                      |   |
| Portable and reserve feed water |   |
| Salt water ballast.             |   |

Details of the actual quantities of the various items aboard are included in Report 7, Stability Inspection Report, submitted by the ships force in accordance with "Instructions to Target Vessels for Tests and Observations by Ship's Force" issued by the Director of Ships Material. This report is available for inspection in the Bureau of Ships Crossroads Files.

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## DETAILED DESCRIPTION OF HULL DAMAGE

### A. General Description of Hull Damage.

The structure above the main deck is almost completely demolished. There was a fire aft which burned out several compartments below the poop deck and consumed the demolished wooden bridge house. Damage was caused by blast and heat which came from the port quarter. There is no significant damage below the main deck.

There is no flooding.

General views of the vessel are shown on pages 38 to 58 , inclusive.

### B. Superstructure.

#### (a) Description of damage.

1. Forecastle - the forecastle deck appears to be undamaged, although considerable material on deck is damaged. The port gun bulwark and 20 mm gun mount are gone. The starboard gun bulwark has been partially torn loose and bent onboard. Pipe railings are mangled. Only one of the ventilation cowls remains standing. The bow machinery appears to be undamaged but it would require an operational test in order to definitely check the condition. The after bulkhead supporting the forecastle deck is severely damaged. Concrete has spalled off, exposing the reinforcing bars. The concrete shell fairing, port and starboard, from the main to the forecastle deck, has failed. (Photos 2007-9, 2008-8 and 2007-5, pages 59 , 60 , and 61 ).

The walkway connecting the forecastle to the midship deck house is demolished and partially lying on deck (Photo 2007-5, page 61 ). The mast is missing. Electrical wiring which had been suspended under the walkway is lying on deck. Undoubtedly there are grounds in the wiring although the circuits have not been tested (Photo 2008-8, page 60 ).

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2. Midship deckhouse - the top structure of the forward, midship deck house is lying on the starboard side of the main deck (Photo 2007-5, page 61 ). The port, starboard and forward bulkheads on the main deck are almost undamaged (Photos 2007-10, 2008-5, pages 62, and 63 ). The after bulkhead is cracked and caved inward on the port side. The O1 deck has a hole where the previous structure was. The remaining deck beam at the forward edge of the hole is broken (Photo 2009-4 and 5, pages 64 and 65 ).

The after, midship deck house is wrecked. The forward transverse bulkhead is bent aft and the port side is bent inward (Photo 2008-7, page 66 ). The after bulkhead is destroyed. (Photo 2008-8 and 2162-10, page 67 and 68). The starboard bulkhead is damaged at the boundaries of the forward and after transverse bulkheads and of the O1 deck and has slight spalling near the door (Photos 2008-5, 2162-10 and 2008-4, pages 63, 68 and 69 ). The O1 deck is caved in and equipment on the main deck is demolished (Photos 2161-1, 3, 2162-3, 4, pages 70, 71, 72, and 73 ). The gun sponson on the port forward corner has dropped (Photo 2008-7, page 74).

The walkway from the midship deckhouse to the poop deck is wrecked (Photo 2008-2, page 66).

3. Stern - the superstructure on the stern is razed by blast and fire. Everything above the O1 level except a few metal objects was burned up in the fire or blown away (Photo 2008-10, page 76 ). The forward, athwartships bulkhead on the main deck appears to be undamaged on the starboard side. The port side has incipient failures resulting from the O1 deck loading and the port shell failure. The transom is slightly caved inward and cracked at the stern. From the stern, forward on the port side, the shell above the main deck has failed at the main deck and at the poop deck levels and is carried inward. (Photo 2007-11, page 76 ). The starboard transom has failed at mid-deck height above the main deck. Forward of this the starboard side has generally failed along the poop deck level. (Photo 2007-9, page 77). Compartments under the poop deck have been razed by fire and damaged by debris from the overhead failure (Photos 2008-1, 2008-2, 2008-3, pages 78, 79 and 80).

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Equipment within the deck houses has been severely damaged by blast, by fire in the after superstructure, and by concrete or debris from falling structure. Pumping machinery in the midship deck house is out of commission (Photos 2161-1, 3, 2162-3, 4, pages 70, 71, 72, and 73). The steering engine can be operated by local control only. (Photo 2161-4, page 61). The ice machinery plant is inoperative.

(b) Causes of damage in each area.

Blast pressure is the principal cause of damage. Fire in the after superstructure is a secondary cause.

(c) Evidence of Fire in the Superstructure.

The wooden pilot house on the poop deck was wrecked by the blast and consumed by fire. The fire burned the interior of the crew's quarters, galley, mess hall, captain's stateroom and refrigerator spaces under the poop deck. The generator room and steering engine room were not touched by the fire but are damaged by debris from the overhead where the poop deck caved inward.

(d) Estimate of relative effectiveness against heat and blast.

No comment.

(e) Constructive criticism of superstructure design or construction, including important fittings and equipment.

No comment.

C. Turrets, Guns, and Directors.

The 20 MM gun foundations and bulwarks are useless.

D. Torpedo Mounts, Depth Charge Gear.

Not applicable.

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E. Weather Deck.

The weather decks have had almost all fittings destroyed. The forecastle deck is apparently undamaged. The main deck is undamaged and usable. The weather deck of the after superstructure is unusable.

Fittings such as davits, handrails, ventilation ducts, and other similar gear are severely damaged or missing. Walkways connecting superstructure forward and aft are severely damaged. The forward which appears to be undamaged mechanically. The after which has partially fallen through the deck. (Photos 2008-8, 2007-5, 2008-2, 2008-10, 2008-1, 2009-3, 2007-4, 2008-12, and 2056-11, pages 60, 61, 74, 75, 76, 80, 82, 83 and 84).

F. Exterior Hull.

The hull structure below the main deck is undamaged. Above the main deck, aft, the shell for one deck height forms part of the superstructure. The port side and stern of this section above the main deck is severely damaged. The starboard side has lighter damage. (Photos 2007-11 and 3, pages 76 and 77). The fairing from the main to the poop deck, port side is also severely damaged. Similarly the port and starboard fairing pieces forward, from the main to the fore-castle deck, are cracked and large sections of concrete are missing. (Photo 2008-8, page 60).

G. Interior Compartments (Above Waterline).

Compartments above the main deck are uninhabitable. Blast has wrecked structure and equipment. Falling debris has further damaged equipment and in the after superstructure fire did additional damage (Photos 2161-1, 3, 2162-3, 4, 2161-4, pages 70, 71, 72, 73 and 81).

H. Armor Decks and Miscellaneous Armor.

Not applicable.

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**I. Interior Compartments (Below Waterline).**

No damage.

**J. Underwater Hull.**

No damage occurred as a result of the test. Subsequently the hull was damaged by collision with resulting flooding. (Photos 2056-10, 11, page 53, and 84).

**K. Tanks.**

No damage.

**L. Flooding.**

None.

**M. Ventilation.**

No special study was conducted regarding damage to ventilation system. In view of the extensive damage to the structure above the main deck, it is most likely that its effectiveness is almost entirely destroyed because of damage to ventilation pipes, ducts, and cowlings on the topside.

**N. Ship Control.**

The steering mechanism is operable but can be controlled only in the steering compartment (Photo 2161-4, page 81).

**O. Fire Control.**

No damage.

**P. Ammunition Behavior.**

No damage.

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**Q. Ammunition Handling.**

Not applicable.

**R. Strength.**

No damage.

**S. Miscellaneous.**

No comment.

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# TECHNICAL INSPECTION REPORT

## SECTION II - MACHINERY

### GENERAL SUMMARY OF MACHINERY DAMAGE

#### I. Target Condition After Test.

(a) Drafts after test; list; general areas of flooding, sources.

No comment.

(b) Structural damage.

No comment.

(c) Other damage.

Nearly all of the machinery was wrecked by direct effect of the blast on exposed machinery, and heavy concrete blocks forming the overhead of machinery spaces. This concrete was broken loose by the blast and fell onto the machinery.

#### II. Forces Evidenced and Effects Noted.

(a) Heat.

The outside forward bulkhead of the poop deckhouse shows evidence of extreme heat and fire. Scorched and blistered paint on exposed surfaces evidence extreme heat from the direction of the blast.

(b) Fires and explosions.

The poop deckhouse was gutted by fire.

(c) Shock.

No evidence.

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(d) Pressure.

Very high blast pressure from starboard wrecked all exposed equipment and carried away some of it. The blast broke loose the thick concrete on the decks and overheads and it fell into spaces below, completely wrecking them.

(e) Effects apparently peculiar to the atom bomb.

The high blast pressure and extreme heat are apparently peculiar to the atom bomb.

III. Effects of Damage.

(a) Effect on machinery and ship control.

All machinery except the anchor windlass was completely wrecked and is considered to be beyond repair.

(b) Effect on gunnery and fire control.

No comment.

(c) Effect on water-tight integrity and stability.

No comment.

(d) Effect on personnel and habitability.

It is believed that if the crew had been aboard during the test all of them would have been killed. Habitability was reduced to practically zero.

(e) Total effect on fighting efficiency.

The ability of the vessel to deliver fuel or lubricants is destroyed. Her capability as a storage tank does not appear to have been seriously impaired.

NOTE: This vessel has no propulsion machinery.

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IV. General Summary.

In view of this vessel's close range during Test A her survival is noteworthy. Protected machinery might have remained operable if the decks and overheads of machinery spaces had been steel instead of concrete.

V. Preliminary Recommendation.

If additional concrete vessels are to be built, consideration should be given to use of steel for decks and overheads.

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## DETAILED DESCRIPTION OF MACHINERY DAMAGE

### A. General Description of Machinery Damage.

#### (a) Overall condition.

The machinery of this vessel, in general, is a complete wreck and is beyond economical repair.

#### (b) Areas of major damage.

Entire ship above main deck.

#### (c) Primary causes of damage in each area of major damage.

Most machinery was wrecked by the heavy concrete blocks forming the overhead of deckhouses being blown down onto machinery. The poop deckhouse was gutted by fire on the starboard side.

#### (d) Effect of target test on overall operation of machinery plant.

Complete destruction.

### B. Boilers.

Not Applicable.

### C. Blowers.

Not Applicable.

### D. Fuel Oil Equipment.

Not Applicable.

### E. Boiler Feedwater Equipment.

Not Applicable.

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### F. Main Propulsion Machinery.

Not Applicable.

### G. Reduction Gears.

Not Applicable.

### H. Shafting and Bearings.

Not Applicable.

### I. Lubrication System.

Not Applicable.

### J. Condensers and Air Ejectors.

Not Applicable.

### K. Pumps.

All pumps damaged and inoperable (See photo 2161-1, 3, pages 70 and 71).

### L. Auxiliary Generators (Turbines and Gears).

Not Applicable.

### M. Propellers.

Not Applicable.

### N. Distilling Plant.

Not Applicable.

### O. Refrigeration Plant.

Damaged and inoperable (See photo 2161-4, page 81).

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P. Winches, Windlasses and Capstans.

The anchor winchless is apparently undamaged. It has been used to drop the port anchor. No power is available for testing the motor.

The warping winch aft is damaged and inoperable. The deck on which the winch was mounted has fallen down into the compartment below.

Q. Steering Engine.

Damaged and inoperable. Equipment in the pilot house and wire rope controls were carried away by the blast. The overhead of the steering room compartment was blown in by the blast and is resting on steering machinery. (See photo 2161-4, page 81).

R. Elevators, Ammunition Hoists, Etc.

Not Applicable.

S. Ventilation (Machinery).

All fans and blowers are damaged and inoperable.

T. Compressed Air Plant.

Not Applicable.

U. Diesels (Generators and Boats).

The two Buda diesel engines for cargo fuel pumps and the two Cummings diesel engines for generators are completely wrecked by heavy concrete overhead being blown in on them (See photo 2162-12, page 85).

V. Piping Systems.

Cargo fuel piping appears tight and undamaged except for the port fuel meter, which was wrecked by heavy overhead falling down. None of this piping has been tested.

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All other piping systems are damaged and inoperable.

W. Miscellaneous.

Miscellaneous equipment is generally wrecked.

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## TECHNICAL INSPECTION REPORT

### SECTION III - ELECTRICAL

#### GENERAL SUMMARY OF ELECTRICAL DAMAGE

##### I. Target Condition After Test.

- (a) Drafts after test; list; general areas of flooding, sources.

When inspected this vessel had a list of approximately 30 degrees to port. Drafts were not observed. There was no flooding which affected electrical equipment.

- (b) Structural damage.

This vessel received extensive structural damage on the main deck and above. The wooden bridge house and all equipment therein burned. Concrete deck houses had their bulkheads and overheads blown in. The wooden catwalk was demolished. This structural damage caused damage to electrical equipment mounted on or near the structure affected.

- (c) Other damage.

Practically all electrical equipment on this vessel was destroyed either by the fire or by the damage to structures. Ship's service diesel generator plant and all power and lighting circuits were damaged beyond repair. Motors and motor controllers were all wrecked beyond repair with the possible exception of the anchor windlass motor and master switch. Practically all lighting fixtures and lamps were demolished. Sound powered telephone circuits and most telephone equipment destroyed. Except for the breakage of indicator lights, the overflow fuel oil alarm indicating system appeared to be undamaged and capable of being operated if power was available.

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## II. Forces Evident and Effects Noted.

### (a) Heat.

Radiant heat from above and aft was evidenced by the scorching of exposed surfaces. This radiant heat did no apparent damage directly to electrical equipment. It is considered, however, that this radiant heat started the fires on the vessel.

### (b) Fires and explosions.

The radiant heat started a fire aft which burned practically all inflammable material and equipment aft on the main deck and above. The areas burned included the vessels living and berthing spaces, steering engine room, engine room, wooden bridge and part of the catwalk. It is estimated that approximately 90% of the electrical equipment in these areas was destroyed by the fire. The equipment in which the original fire started is not evident since the entire area is so badly burned.

### (c) Shock.

There was some evidence of shock to electrical equipment. This shock is considered to be mostly a secondary effect. It caused equipment mounted on structures to become missiles. When these missiles struck other equipment or structures the impact caused damage to the equipment hit or to equipment mounted on the structures. Effects of apparent shock were noted in broken phenolic parts of switches and cracked or broken cast iron parts.

### (d) Pressure.

Air blast from above and aft is considered to be the primary cause of damage to this vessel. Even though the fire caused extensive damage, much of the equipment that was burned had previously been damaged by the blast. The blast in carrying away structures damaged the electrical equipment mounted on these structures.

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### (e) Any effects apparently peculiar to the Atom Bomb.

There were no effects noted that are considered peculiar to the Atomic Bomb other than radioactivity and the intensity of the heat wave.

## III. Effects of Damage.

### (a) Effect on electrical equipment and ship control.

The electric plant was almost completely destroyed. Almost all electrical equipment was damaged beyond practical repair. Ship's control was destroyed.

### (b) Effect on gunnery and fire control.

All gunnery and fire control was destroyed.

### (c) Effect on watertight integrity and stability.

No comment.

### (d) Effect on personnel and habitability.

The effects of radioactivity on personnel and habitability are not known. Neglecting radioactivity there would have been very heavy personnel casualties due to the air blast, radiant heat and missiles. The ship was not habitable since all berthing and messing facilities were destroyed by fire.

### (e) Total effect on fighting efficiency.

This vessel could not perform its primary function which is handling its cargo of fuel oil. From an electrical standpoint the fighting efficiency of the vessel was zero.

## IV. General Summary of Observer's Impressions and Conclusions.

While electrical equipment was almost entirely destroyed by this test, most of the electrical damage was of a secondary nature.

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having been caused by missiles due to concrete structure going away and due to fires.

V. Any Preliminary General or Specific Recommendations of the Inspecting Group.

None.

## DETAILED DESCRIPTION OF ELECTRICAL DAMAGE

### A. General Description of Electrical Damage.

#### (a) Overall condition.

Practically all major electrical equipment was damaged beyond repair.

#### (b) Areas of major damage.

The main deck and above was the area of major damage.

Damage was most severe aft.

#### (c) Primary causes of damage in each area of major damage.

The majority of electrical damage was from secondary causes such as fire, missiles and failure of related equipment. The cause of these secondary effects was primarily radiant heat and air blast.

#### (d) Effect of target test on overall operation of electric plant.

As a result of this test all electrical equipment was rendered inoperable either due to fire, missiles, failure of related equipment or directly from the air blast.

#### (e) Types of equipment most affected.

All electrical equipment was heavily damaged.

### B. Electric Propulsion Rotating Equipment.

Not applicable.

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C. Electric Propulsion Control Equipment.

Not applicable.

D. Ship's Service Generators.

The concrete overhead of the engine room was blown down on the 40 K.W. 120/240 volt D.C. 1200 RPM, Buda Westinghouse diesel generators badly damaging the engines, however, the generators did not appear to be seriously damaged. Condition of engines prevented operation of the units but there was no apparent distortion of the foundations or misalignment. Some concrete fragments had fallen in the brush riggings but could have easily been cleaned out. Major overhaul necessary for the diesel engines. Photograph AACR-88-2162-8, page 86, shows the generator and the distortion resulting to the cables and terminal box of one unit.

E. Emergency Generators.

Not applicable.

F. Switchboards and Distribution Panels.

(a) The main generator and distribution switchboard located in the engine room was damaged by the fire, the falling overhead and by missiles. Some instrument glasses were broken and cables burned by the fire. The switchboard would require major repairs to restore operability. Refer to photograph AACR-88-2162-5, page 87).

(b) All power panels were damaged beyond repair. The Square "D" power panel located in the engine room was destroyed by fire, the one located in the forward pump room was smashed when the bulkhead upon which it was mounted was demolished and the Cutler Hammer power panel located in the forward pump room was destroyed by missiles.

(c) The Square "D" lighting panel shown in photograph AACR-88-2162-9, page 88, which was mounted in the trunk leading to the superstructure aft was not affected by the fire and appears undamaged except for the broken switch covers. There was no evidence of

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missiles or distortion it is therefore considered that this damage can be attributed to shock.

G. Wiring, Wiring Equipment and Wireways.

(a) Approximately 80% of all topside cable was severed, either from associated equipment carrying away or by missiles.

Exposed cable forward was scorched by the radiant heat and all cable aft was destroyed by the fire.

The wireways suspended from the catwalk were destroyed when the catwalk was twisted and broken by the air blast. These wireways were secured to the catwalk by means of wood screws which pulled out upon distortion of the catwalk. Refer to photograph AACR-88-2162-10, page 88. These cables from the after deck house, prior to running under the catwalk were destroyed by fire.

H. Transformers.

Not applicable.

I. Submarine Propelling Batteries.

Not applicable.

J. Portable Batteries.

The trays comprising the auxiliary lighting and power battery, the two diesel starting batteries and the standby diesel starting battery were totally destroyed by the fire.

K. Motors, Motor Generator Sets and Motor Controllers.

(a) The Waring Winch motor located aft on the deck house was damaged beyond repair. The deck upon which it was mounted gave way into the compartment below. The contactor panel located in the engine room was distorted and damaged beyond practical repair by missiles. The resistor banks broken, frame bent, top section of the lamin-

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ated phenolic panel broken and majority of the contactors badly damaged. Refer to photograph AACR-88-2162-6, page 27.

(b) Motors and controllers for all ventilation fans were destroyed by the fire.

(c) The Century Electric 3 H.P., 230 volt, 1750 RPM, D.C. motor for the fresh water pump, located in the engine room was undamaged, however, the pump was smashed by missiles and its Allen Bradley commercial controller was destroyed when crushed between a pipe that had distorted and the bulkhead.

(d) One portable explosion-proof blower had acted as a missile and impacted against the base of one of the diesel generators. The blower was damaged beyond repair, however, it apparently did no damage to the generator.

(e) The refrigeration motors and controllers were destroyed by the fire.

(f) The ballast or cargo pump motors were all destroyed by falling bulkheads and overheads. These motors were so covered by concrete that a complete examination could not be made. Controllers for these motors were also destroyed. Photographs AACR-88-2162-3, page 7, and 2162-4, page 1/3, show one cargo pump motor and one controller which is typical of the damage occurring to these items.

(g) The anchor windlass motor and master switch are apparently operable, however, the controller was destroyed by the bulkhead to which it was secured giving away.

(h) The steering engine motor and control equipment were destroyed by the fire.

(i) The 500 watt 230 volt D.C. 120 volt A. C. motor-generator set located in the engine room was knocked from its mounting and smashed. This was due to the bulkhead caving in.

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#### L. Lighting Equipment.

(a) Approximately 95% of all lamps were either broken, by shock and missiles, or destroyed by fire.

(b) Some lighting fixtures that were secured to the concrete bulkheads and overheads were torn loose by missiles and shock. In almost all of these cases the anchor bolts had pulled out.

#### M. Searchlights.

The entire superstructure was carried away by the air blast or burned, therefore the 12 inch signal searchlight was missing.

#### N. Degaussing Equipment.

Not applicable.

#### O. Gyro Compass Equipment.

Not applicable.

#### P. Sound Powered Telephones.

One headset that was left exposed at the anchor windlass station received a distorted diaphragm from the air blast and both receivers were broken in striking equipment near by.

Some headsets were damaged by missiles in the amidship deck house. They were stowed in a pile on deck and had no protection. There was no evidence of direct damage to these headsets from the air blast.

All sound powered equipment aft was destroyed by the fire.

A pressed steel headset cabinet that was mounted exposed at the pump station amidships was flattened against the bulkhead by the air blast.

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Q. Ship's Service Telephones.

Not applicable.

R. Announcing Systems.

Not applicable.

S. Telegraphs.

Not applicable.

T. Indicating Systems.

The fuel oil overflow alarm and indicating system appears operable, however three indicating lamps were broken on the panel by missiles.

U. I. C. and A. C. O. Switchboards.

Not applicable.

V. F. C. Switchboards.

Not applicable.

W. Miscellaneous.

- (a) All bracket fans were destroyed by the fire.
- (b) The drinking fountains and electric coffee urn were destroyed by the fire.

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SECTION IV

PHOTOGRAPHS

TEST ABLE

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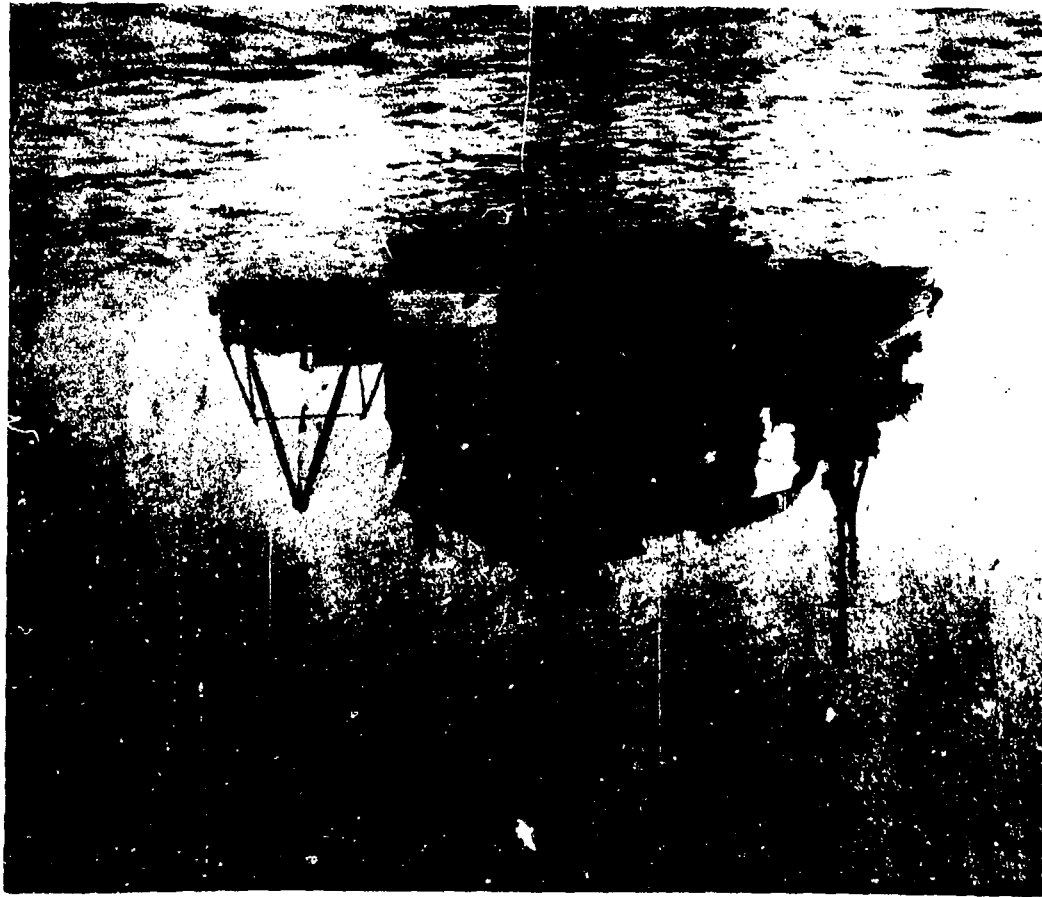


BA-CR-65-106-1. View from dead ahead before Test A.

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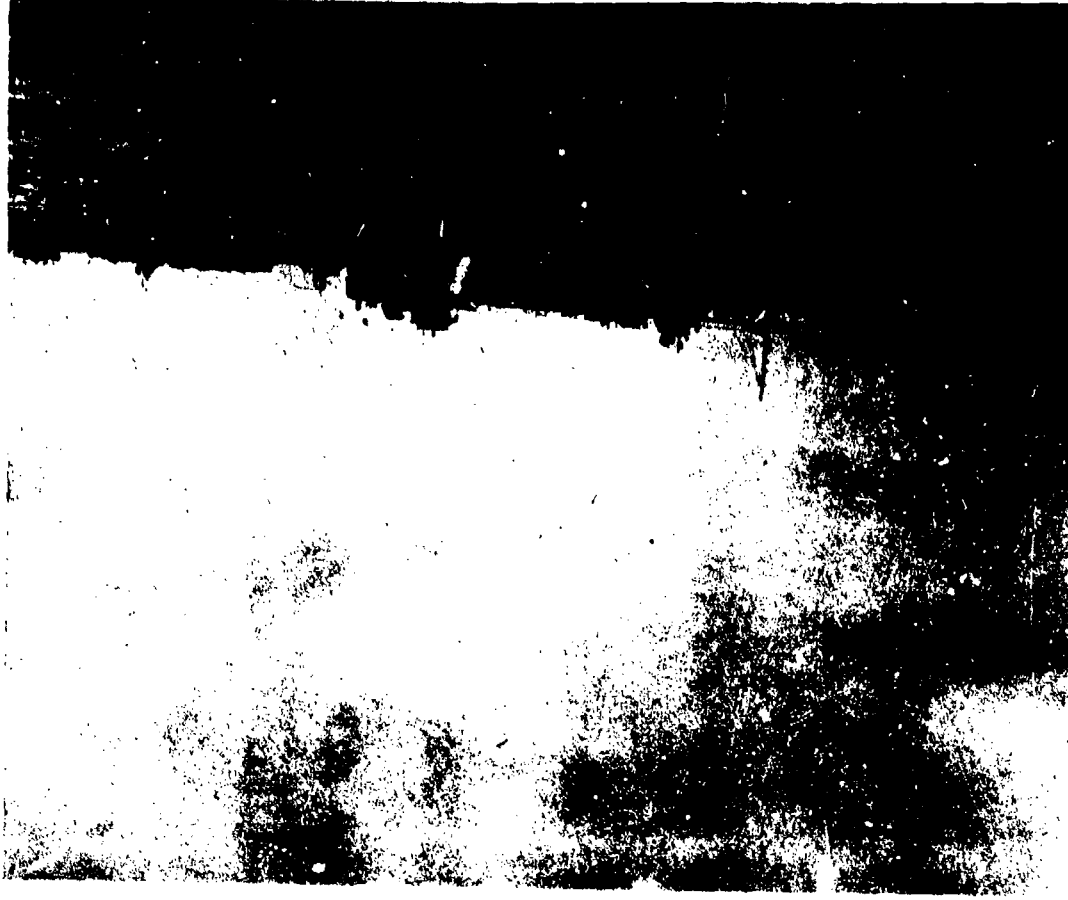


AA-CR-227-92-79. View from dead ahead after Test A.

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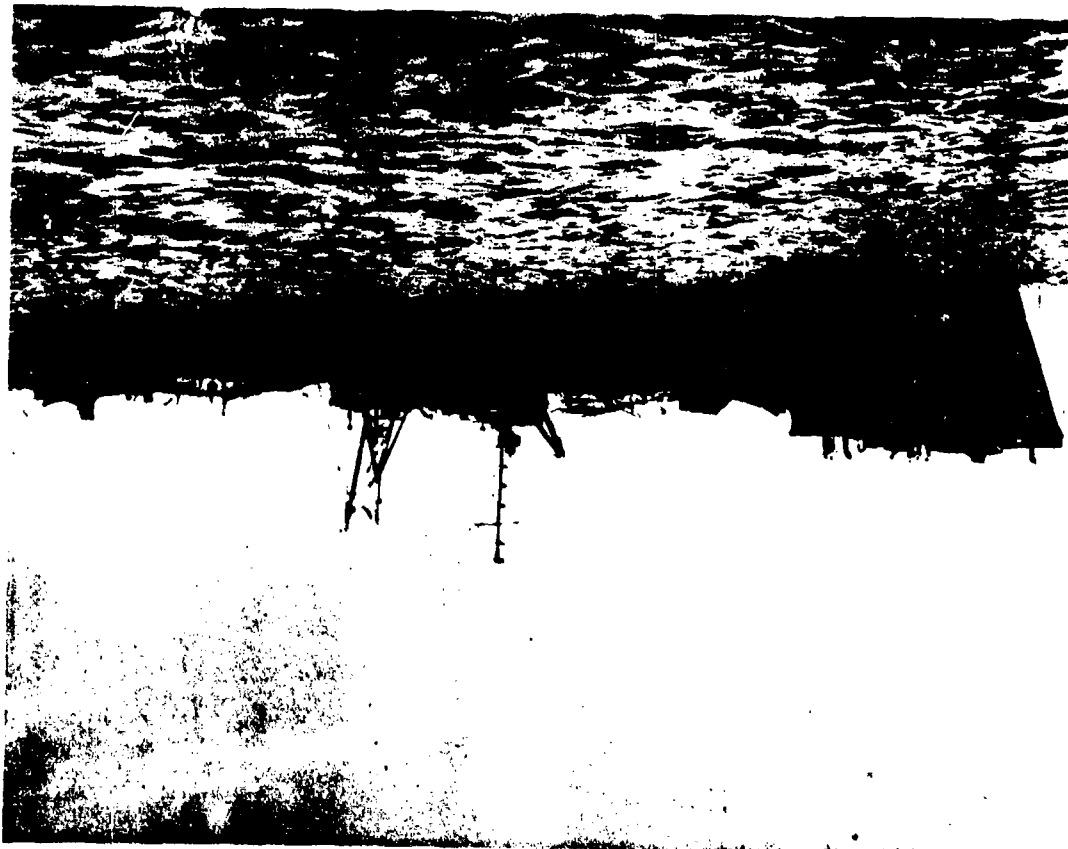


BA-CR-65-105-10. View from port bow before Test A.

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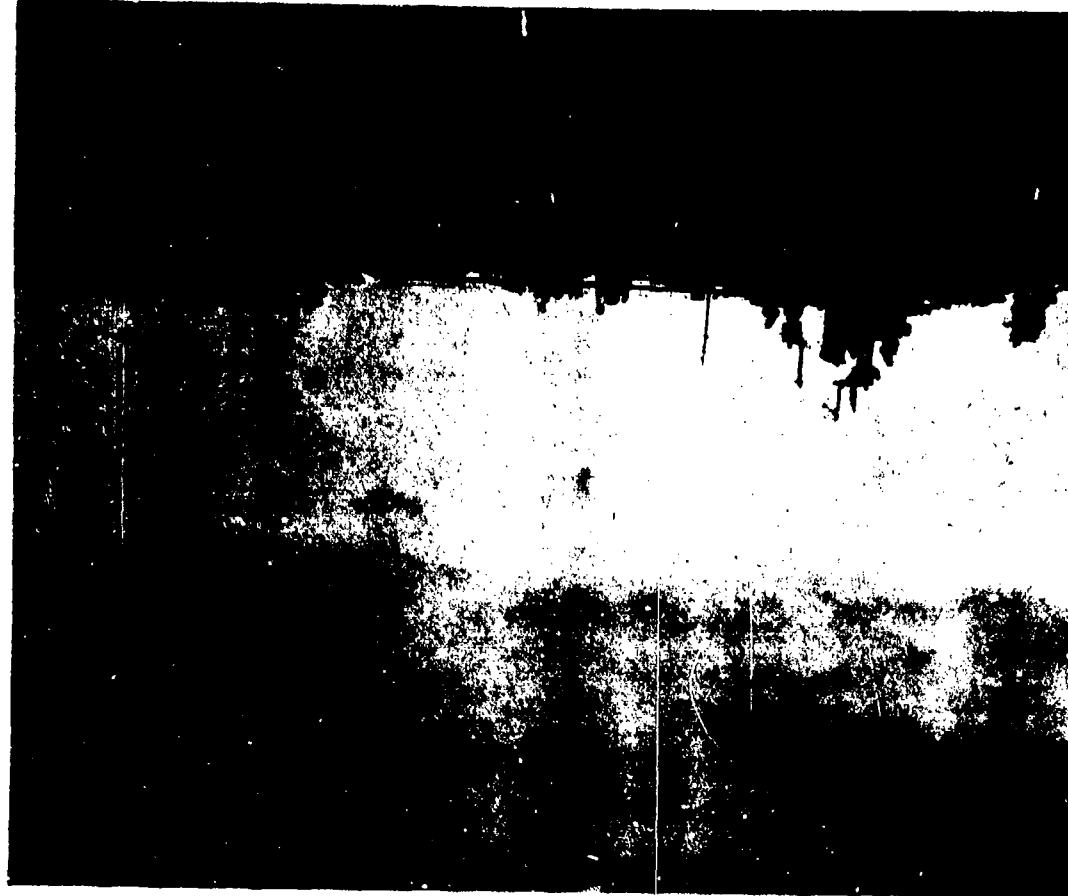


AA-CR-227-92-78. View from port bow after Test A.

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BA-CR-65-105-9. View from port beam before Test A.

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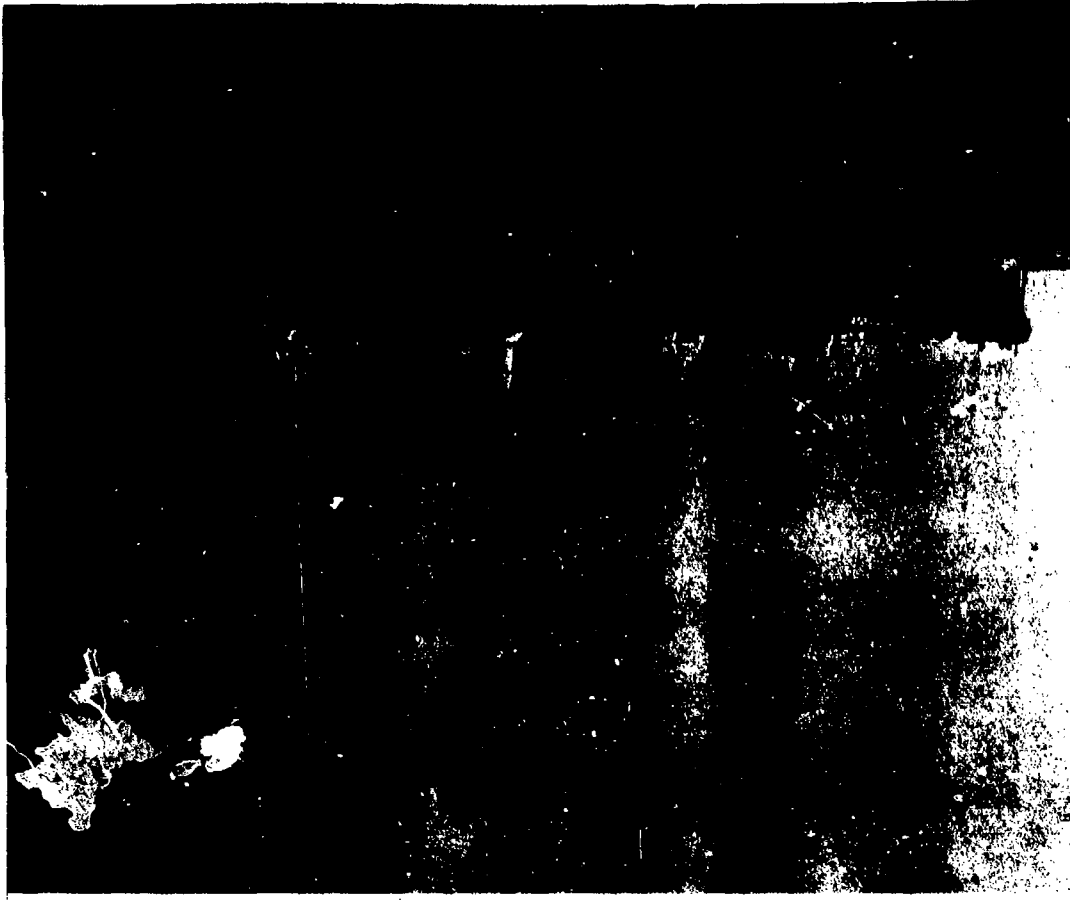


AA-CR-227-92-77. View from port beam after Test A.

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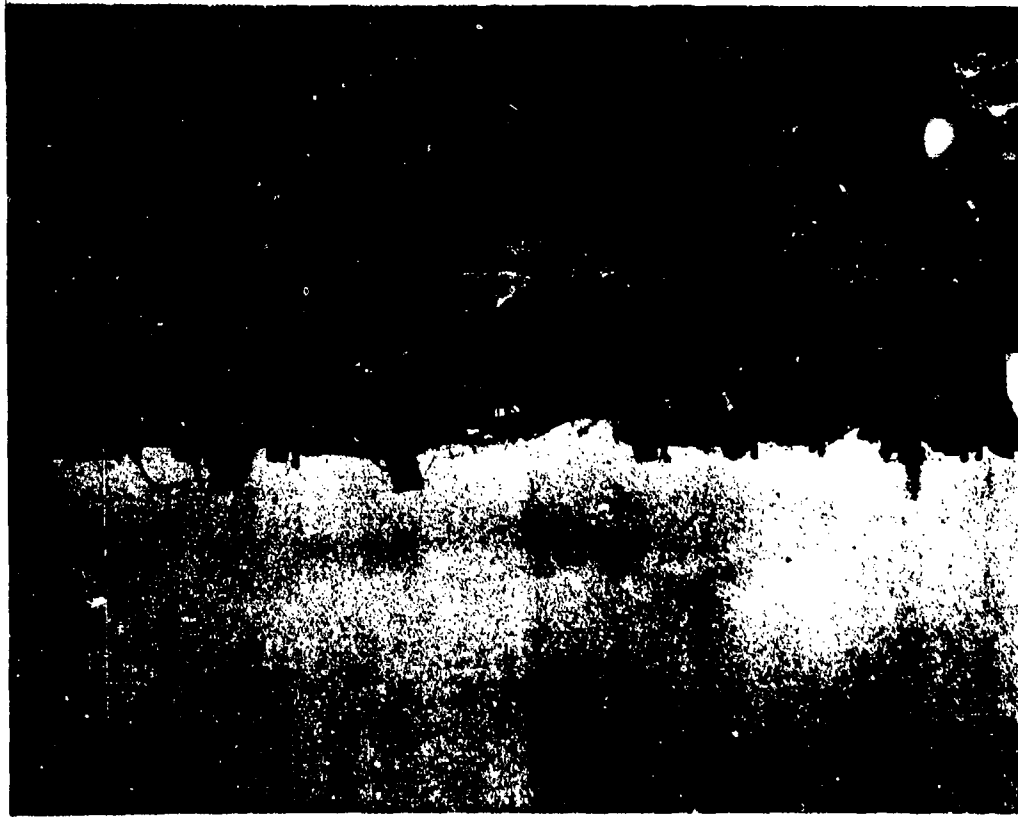


BA-CR-65-106-11. View from port quarter before Test A.

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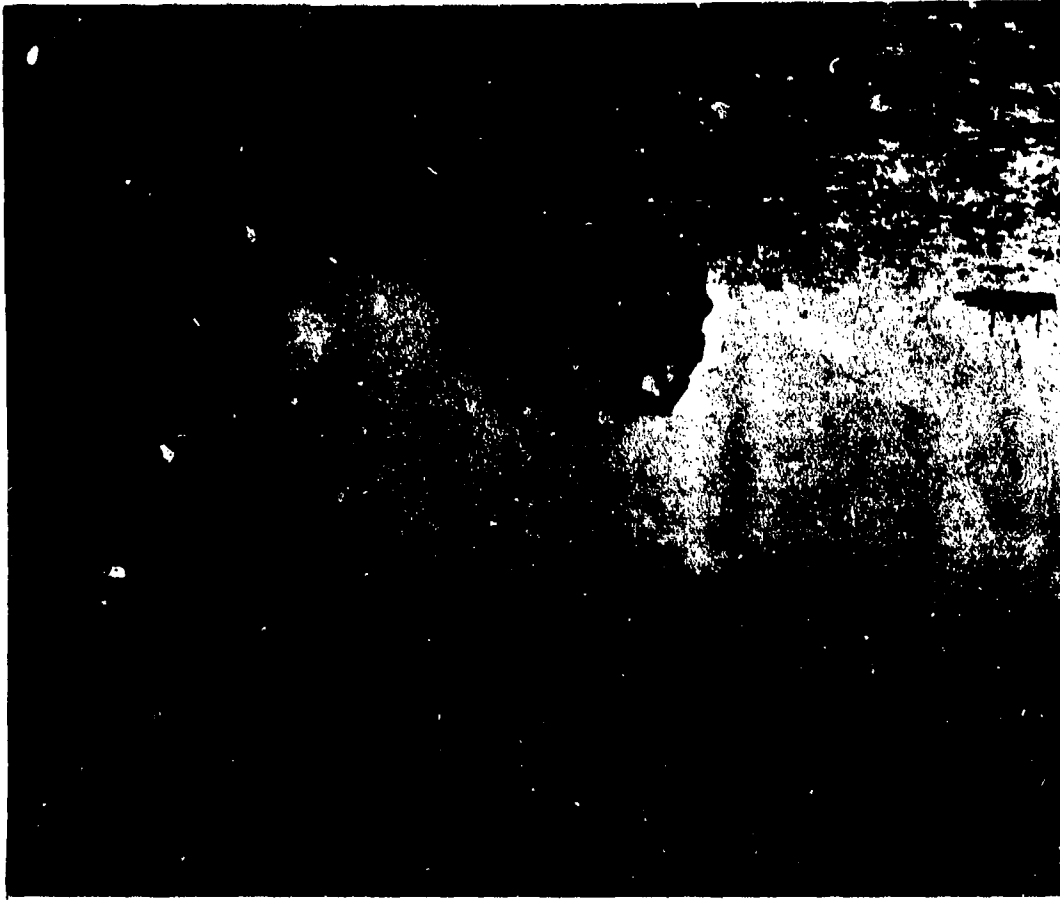


BB-CR-227-520-112. View from port quarter after Test A.

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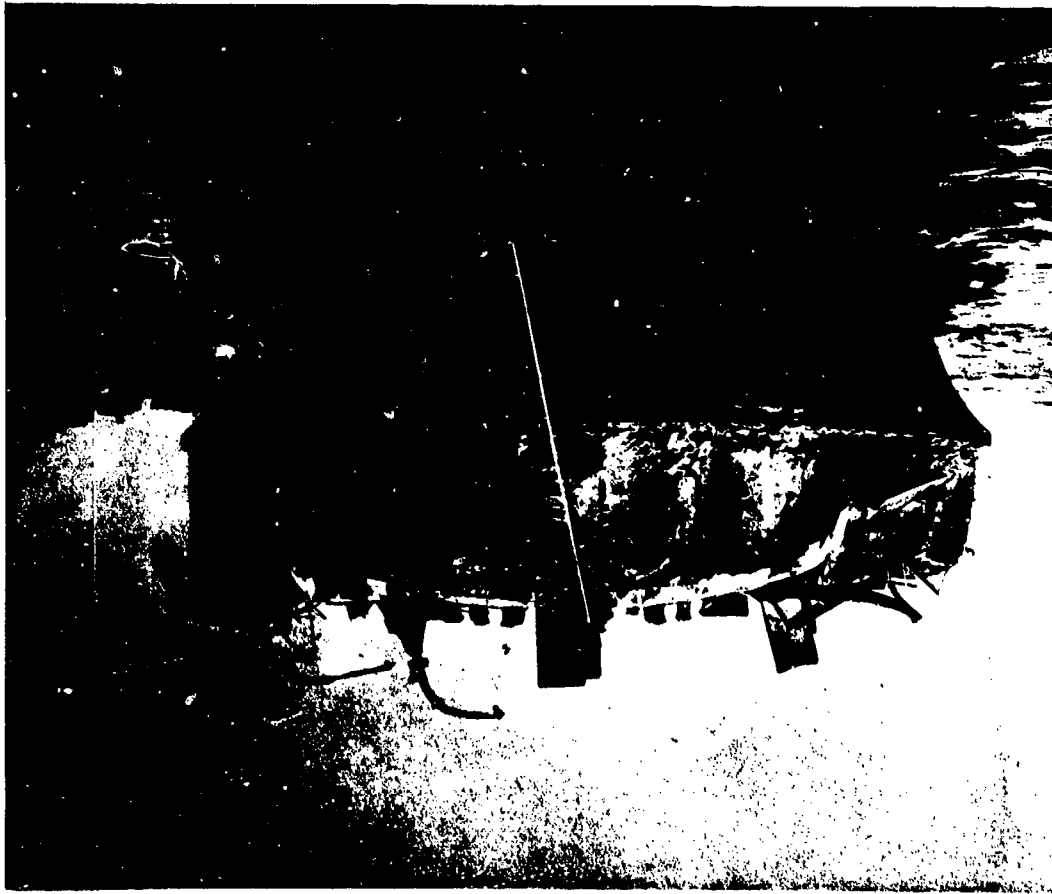


BA-CR-65-105-12. View from stern before Test A.

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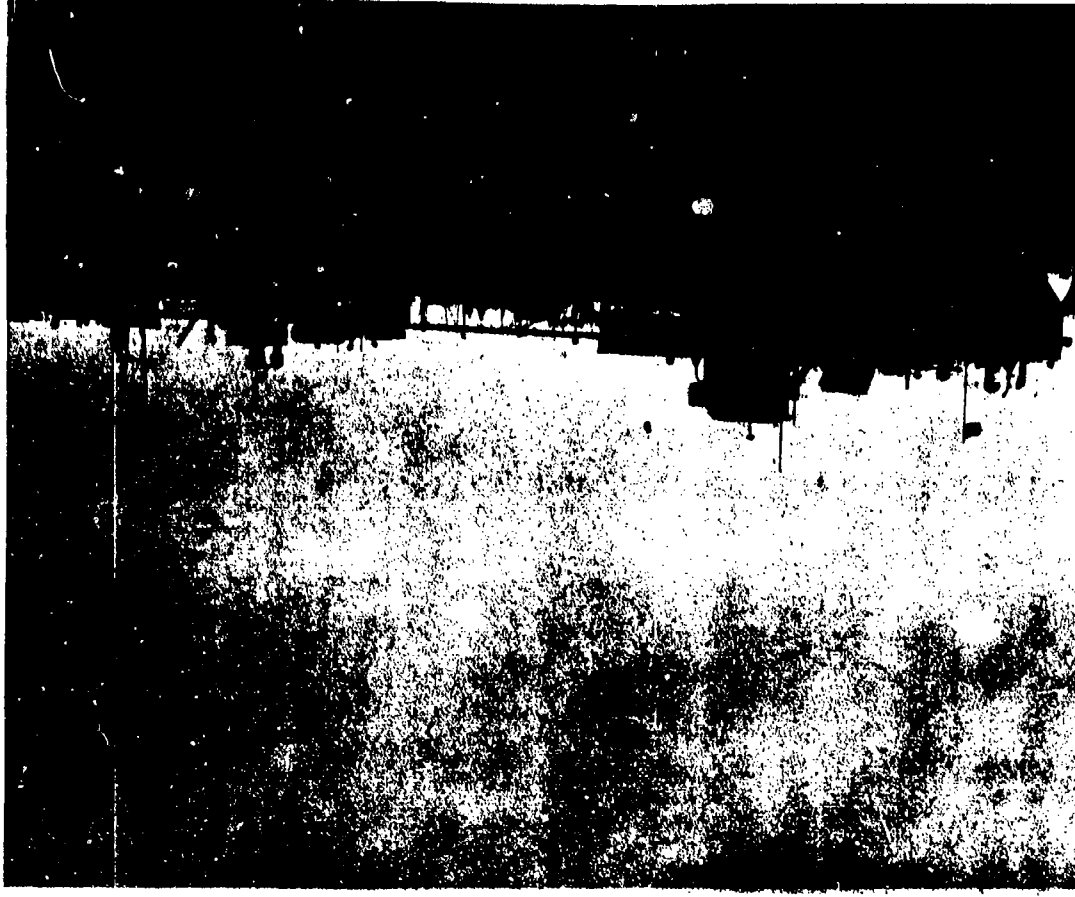


BB-CR-227-520-105. View from stern after Test A.

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BA-CR-65-106-4. View from starboard quarter before Test A.

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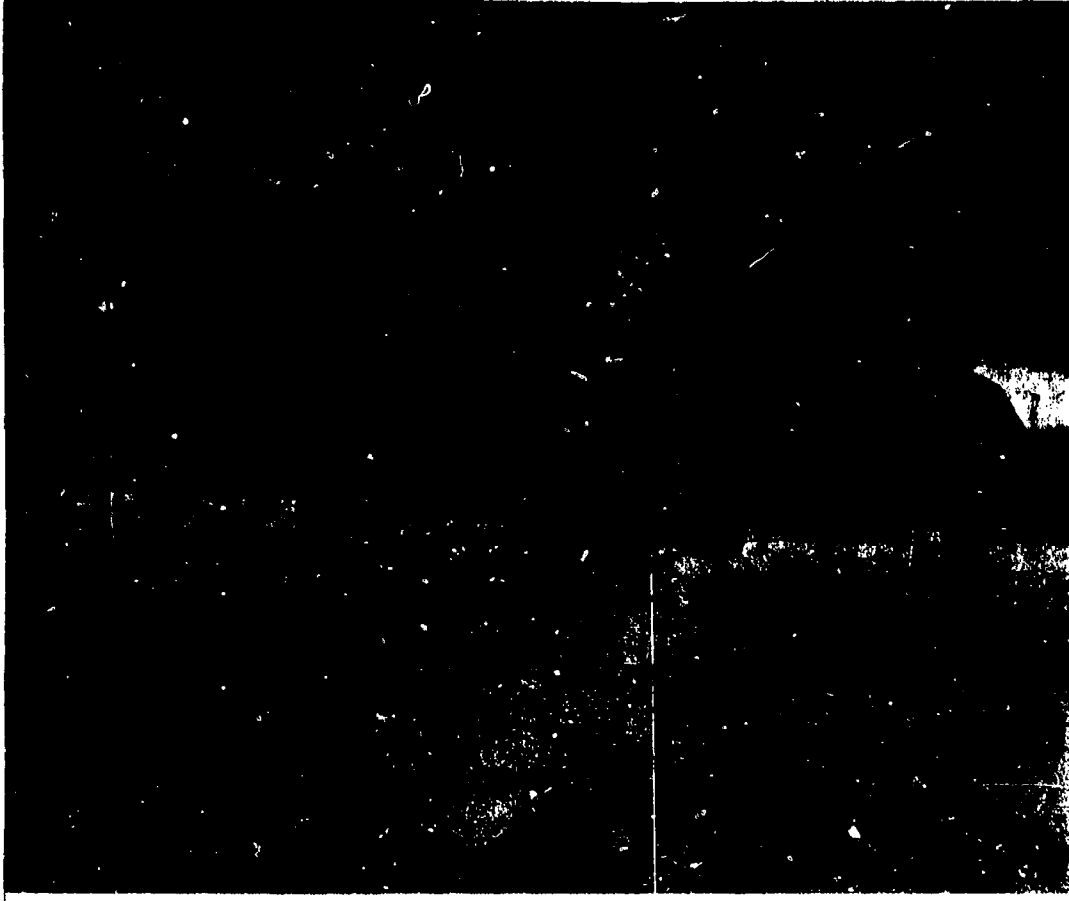


BB-CR-227-520-106. View from starboard quarter after Test A.

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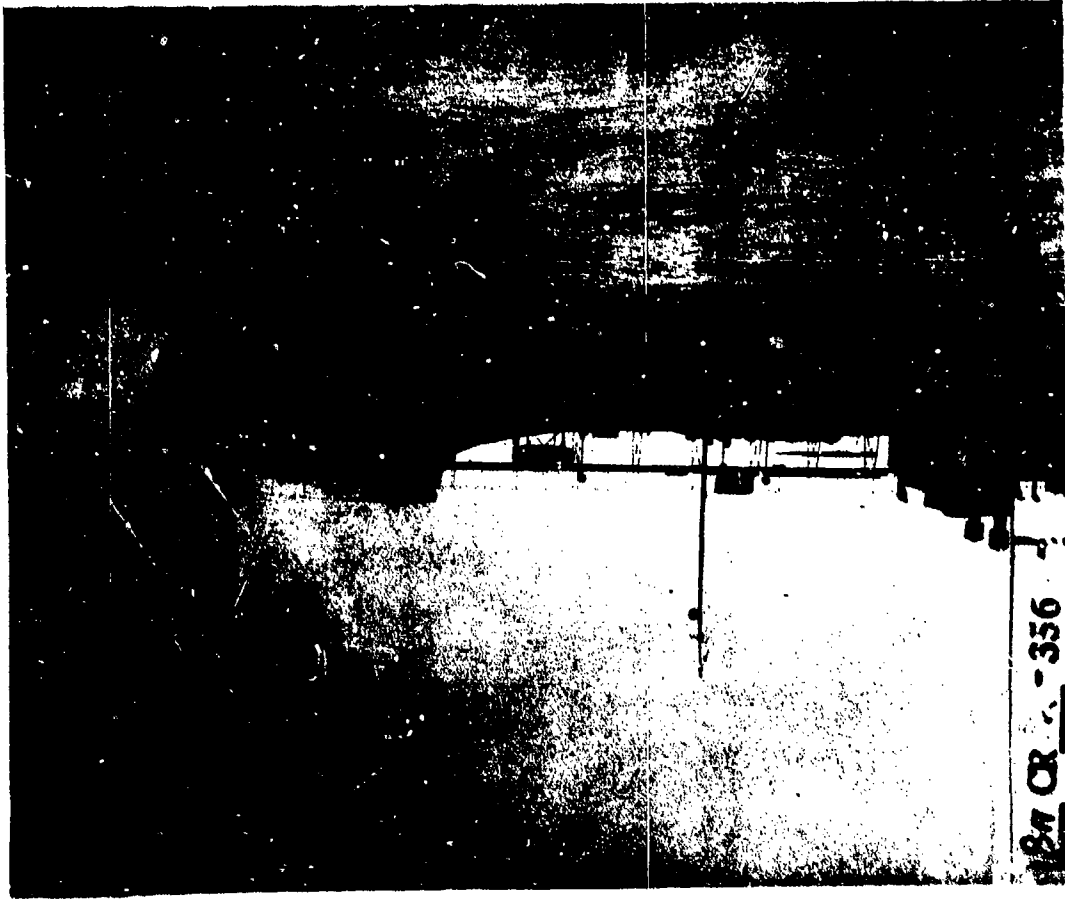
BA-CR-62-356-6. View from starboard side aft before Test A.

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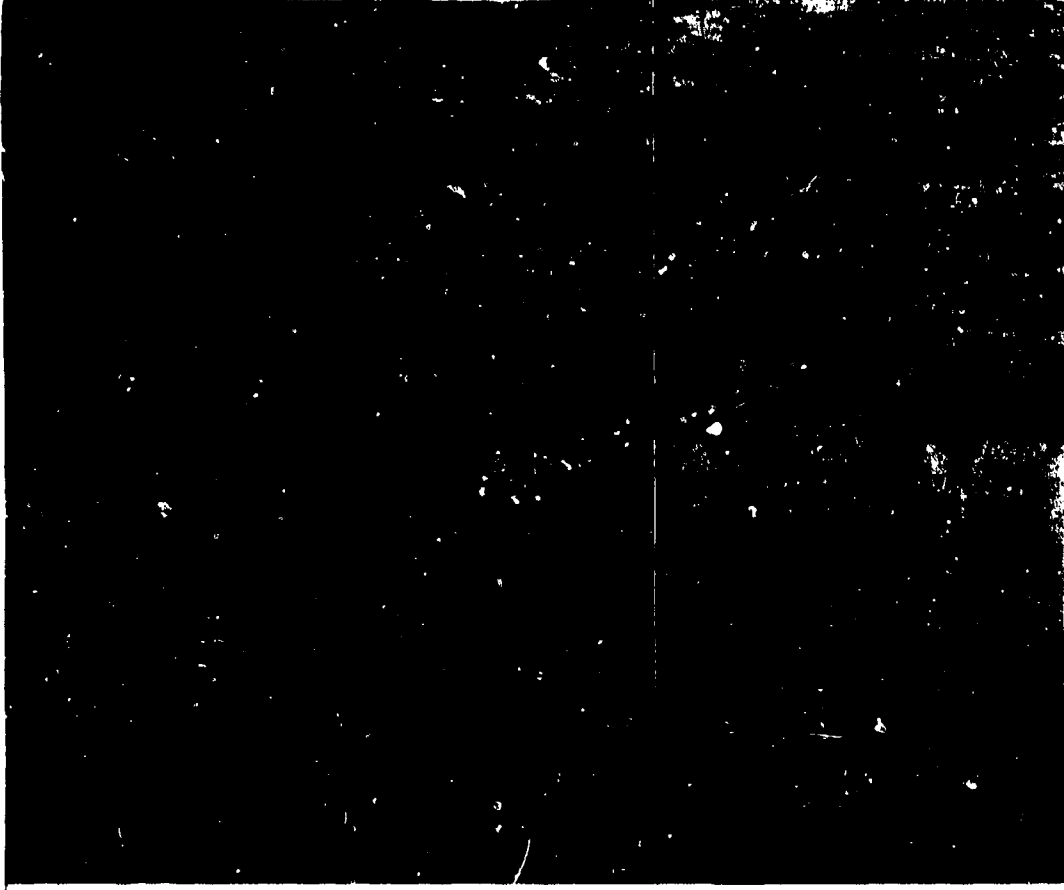


BA-CR-62-356-8. View from starboard side forward before Test A.

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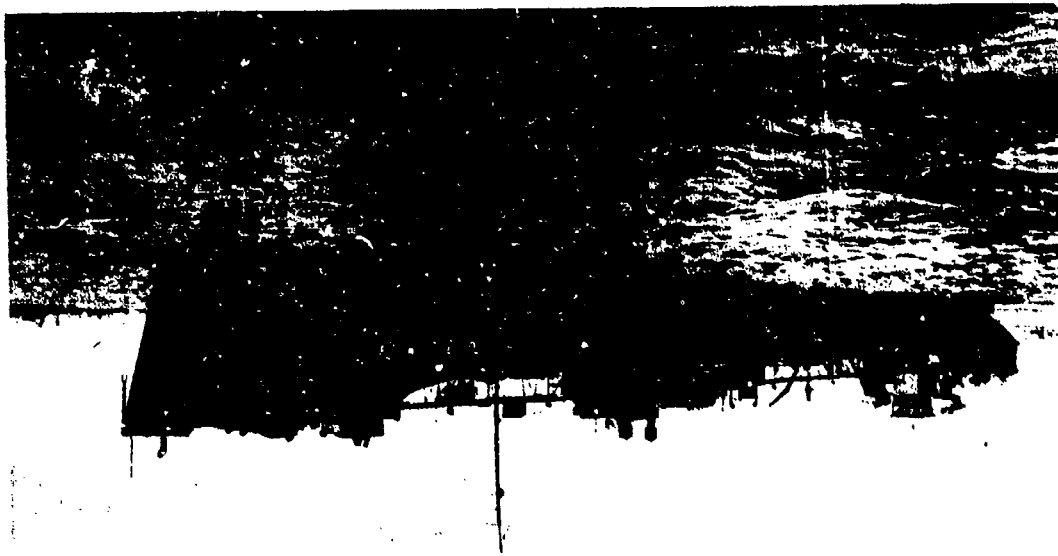


BB-CR-227-520-107. View from starboard beam after Test A.

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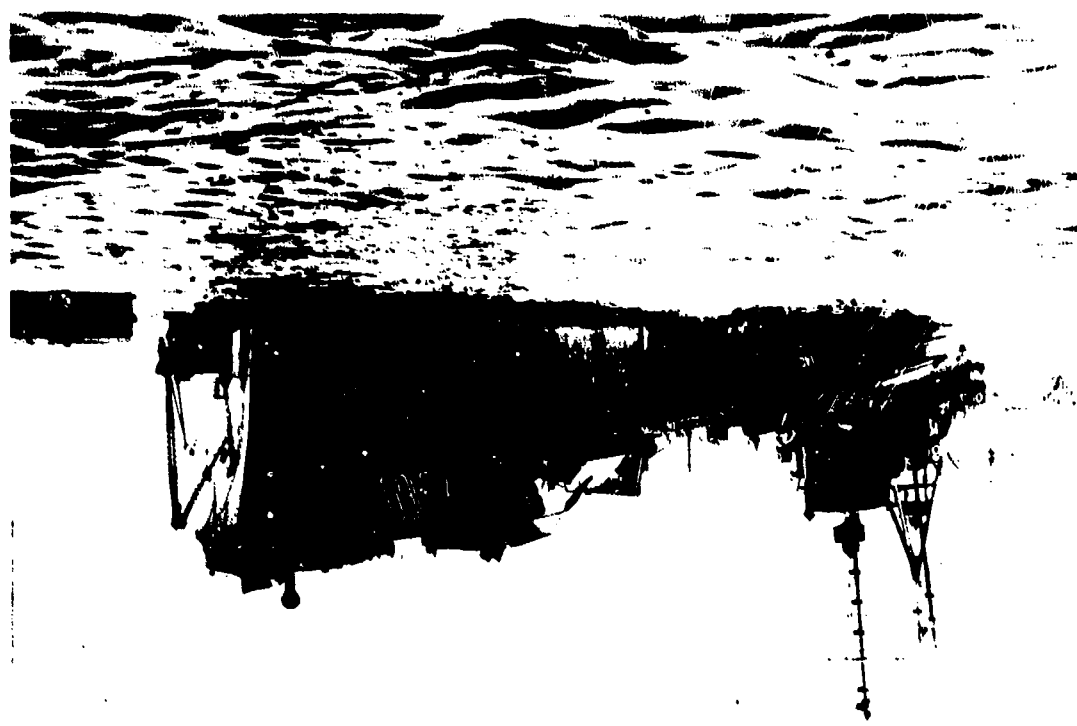


BA-CR-65-106-2. View from starboard bow before Test A.

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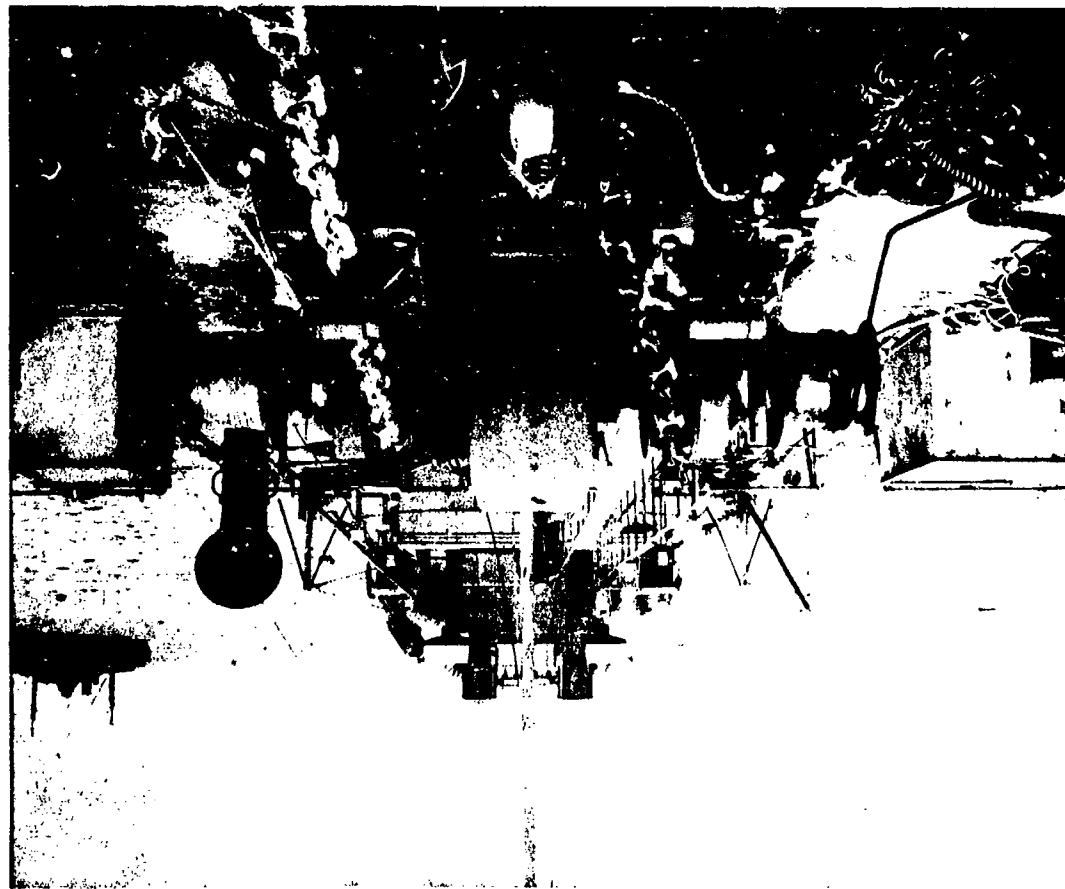


AA-CR-227-92-80. View from stern during Test A.

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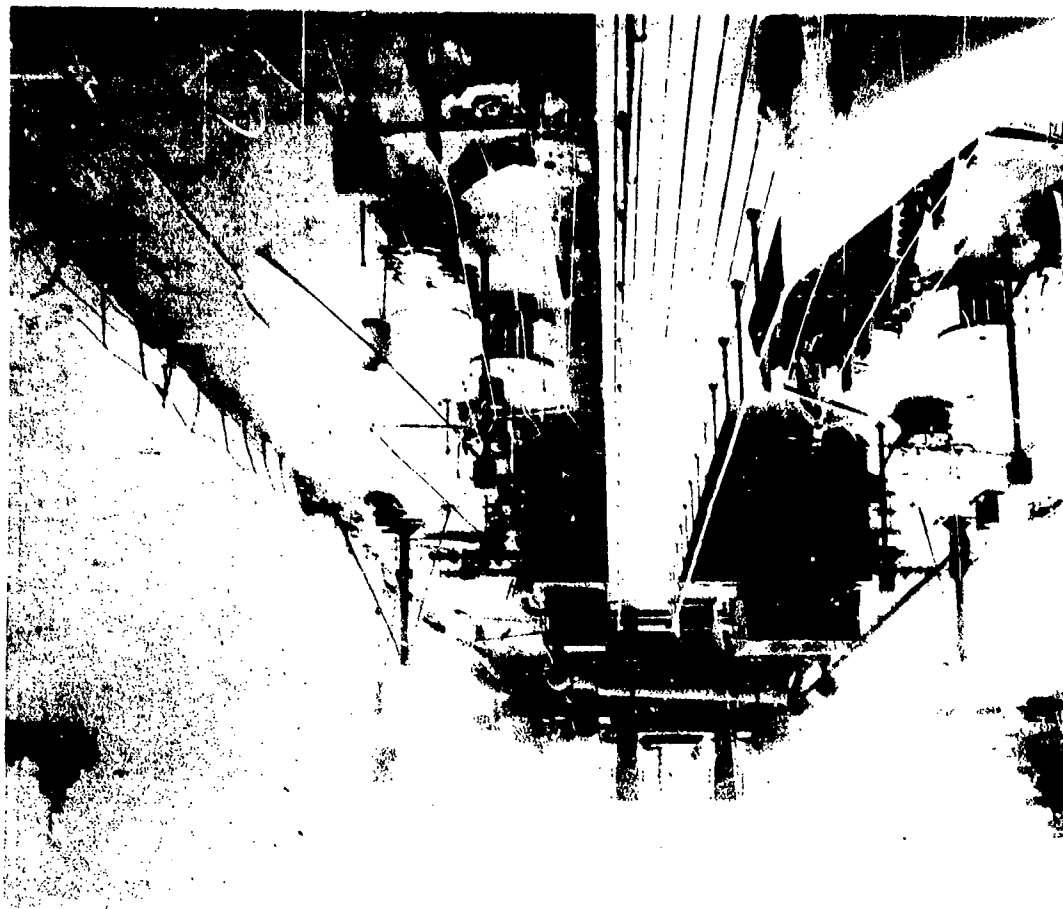


BA-CR-65-229-5. Looking aft from bow before Test A.

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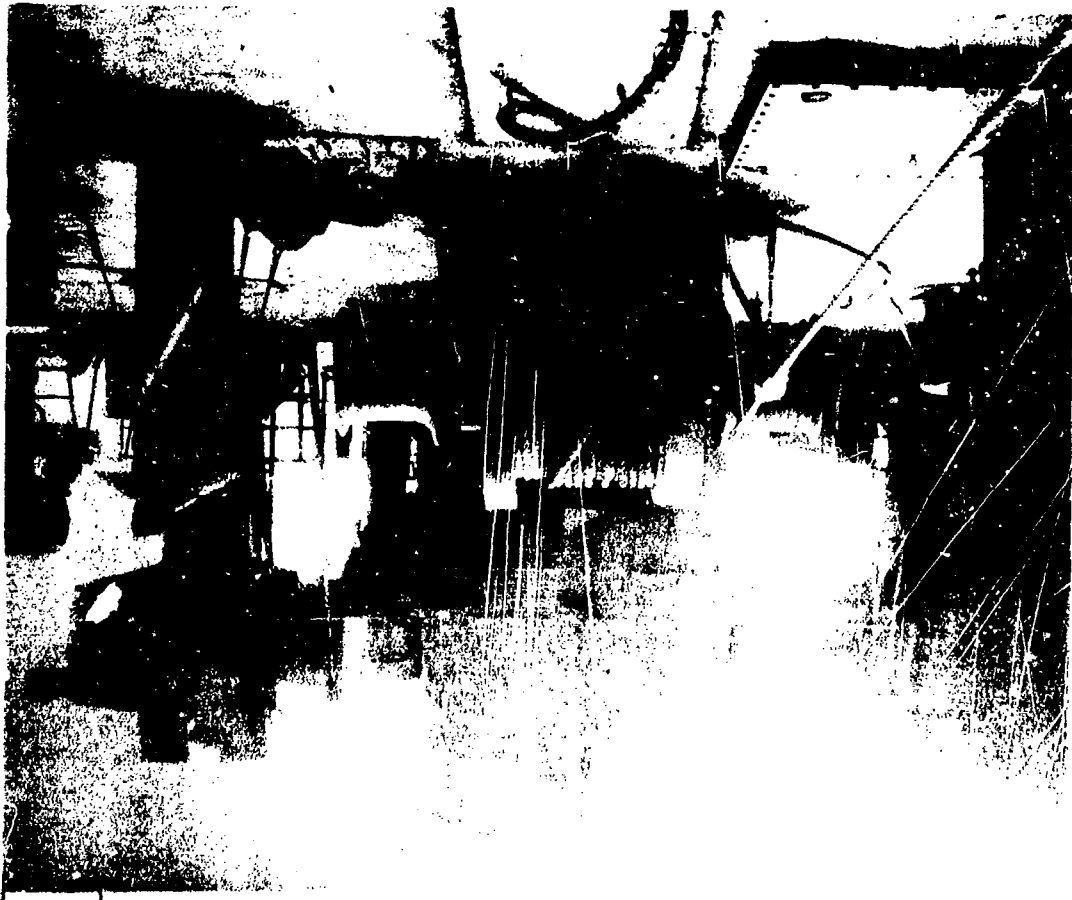


BA-CR-65-229-7. Looking forward from bridge before Test A.

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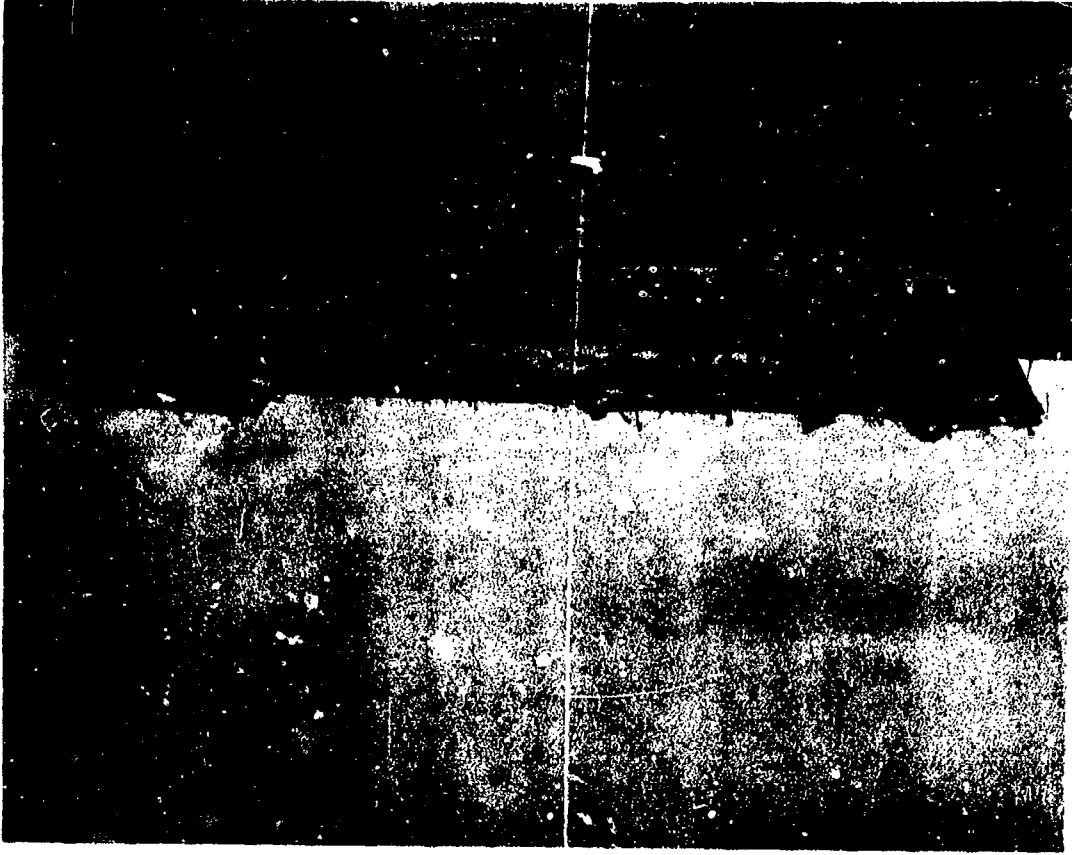


BA-CR-86-920-4. Looking forward to bridge from stern before Test A.

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AA-CR-59-2056-10. General view of topside damage after Test A. List is a result of a collision that occurred after the test and is not incident to the test.

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AA-CR-58-2007-9. View of port side forward after Test A.

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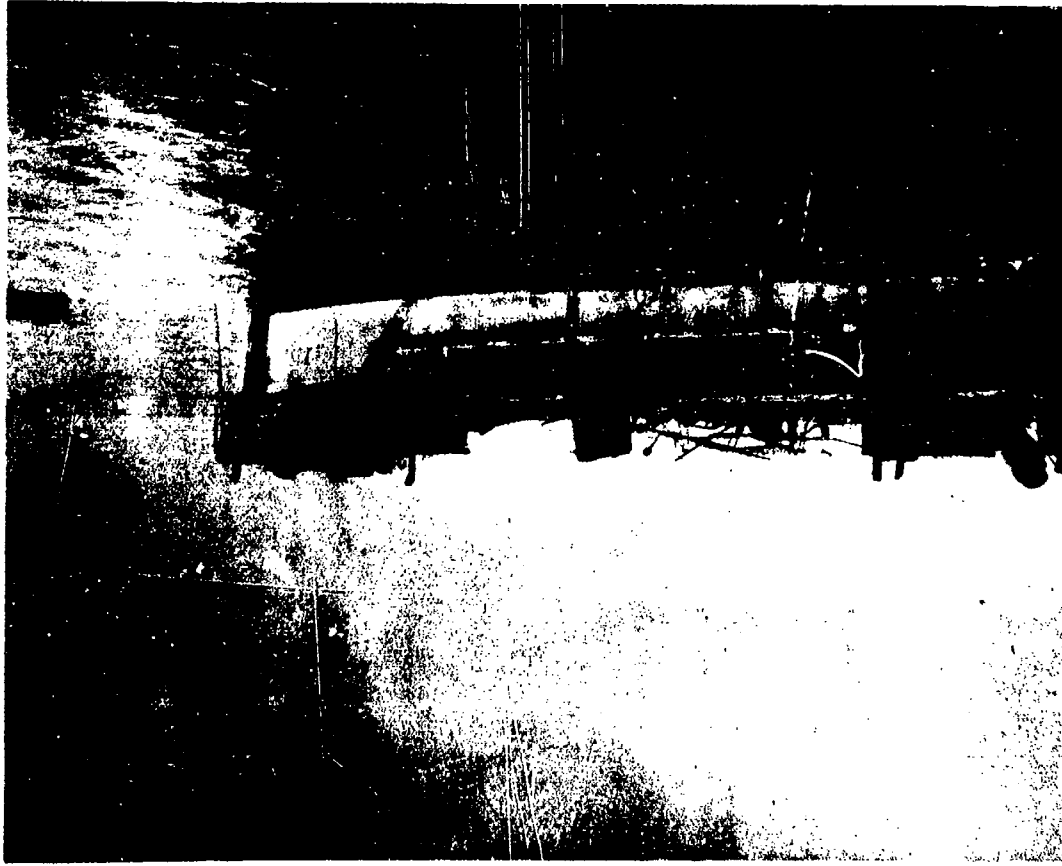


AA-CR-58-2008-8. Rear transverse bulkhead supporting forecastle deck. Looking forward.

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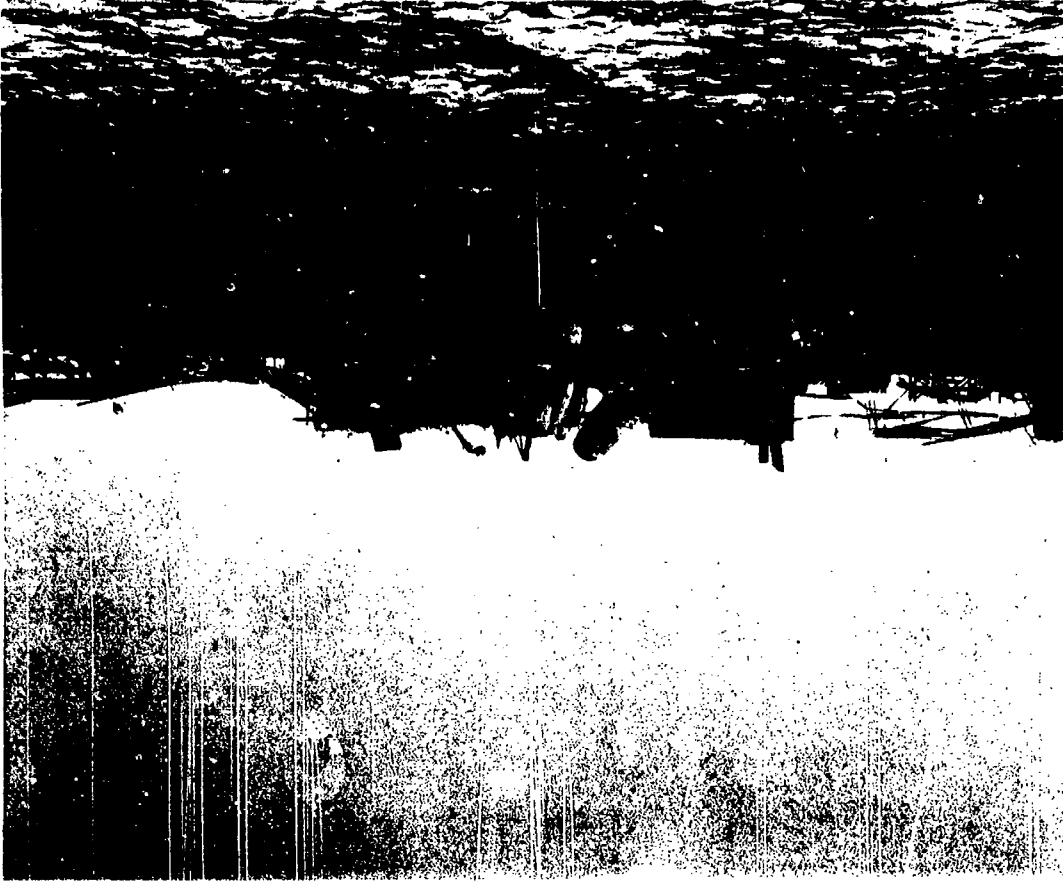


AA-CR-58-2007-5. View of starboard side forward after Test A.

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AA-CR-58-2007-10. View of port side midships after Test A.

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AA-CR-58-2009-4. Damage to overhead beams in forward midship deckhouse looking to port.

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AA-CR-58-2009-5. Damage to overhead beams in forward midship deckhouse looking to starboard.

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AA-CR-58-2009-5. Damage to overhead in forward midship deckhouse, looking to starboard.

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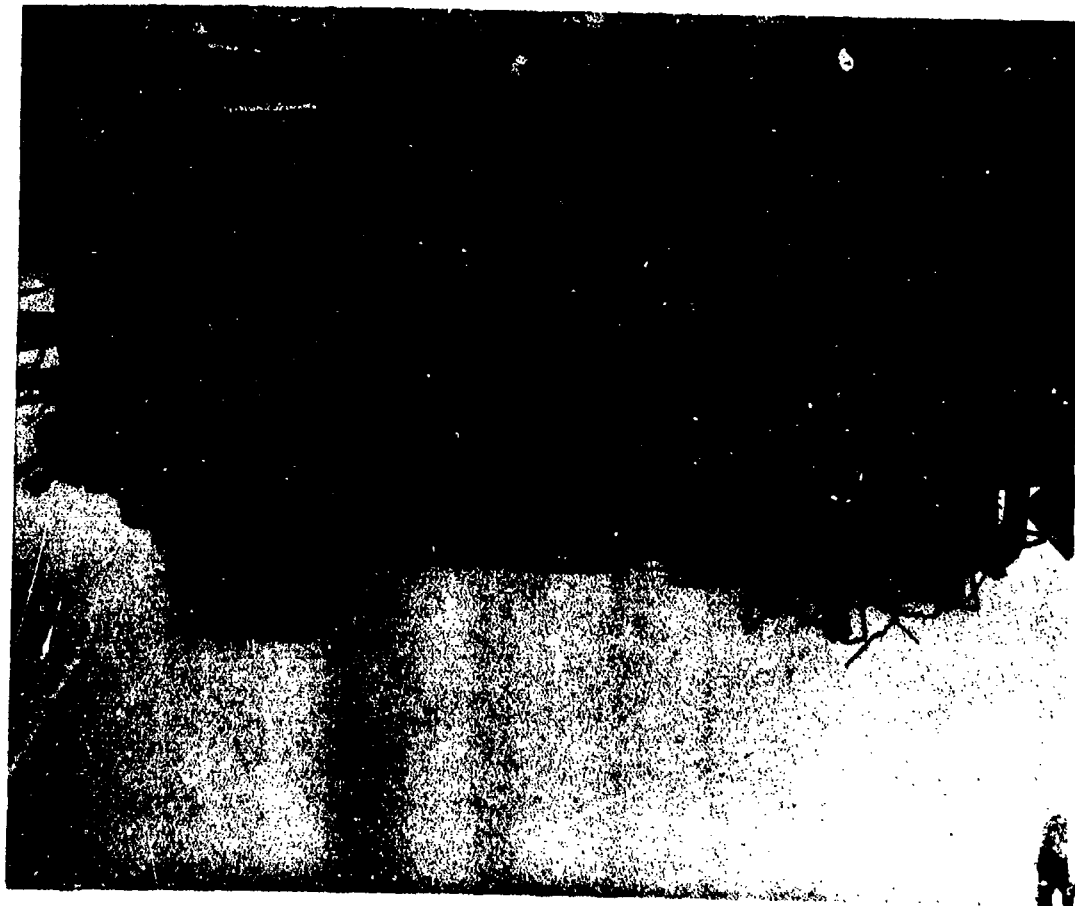
AA-CR-58-2008-7. After midship deckhouse, forward port cover.

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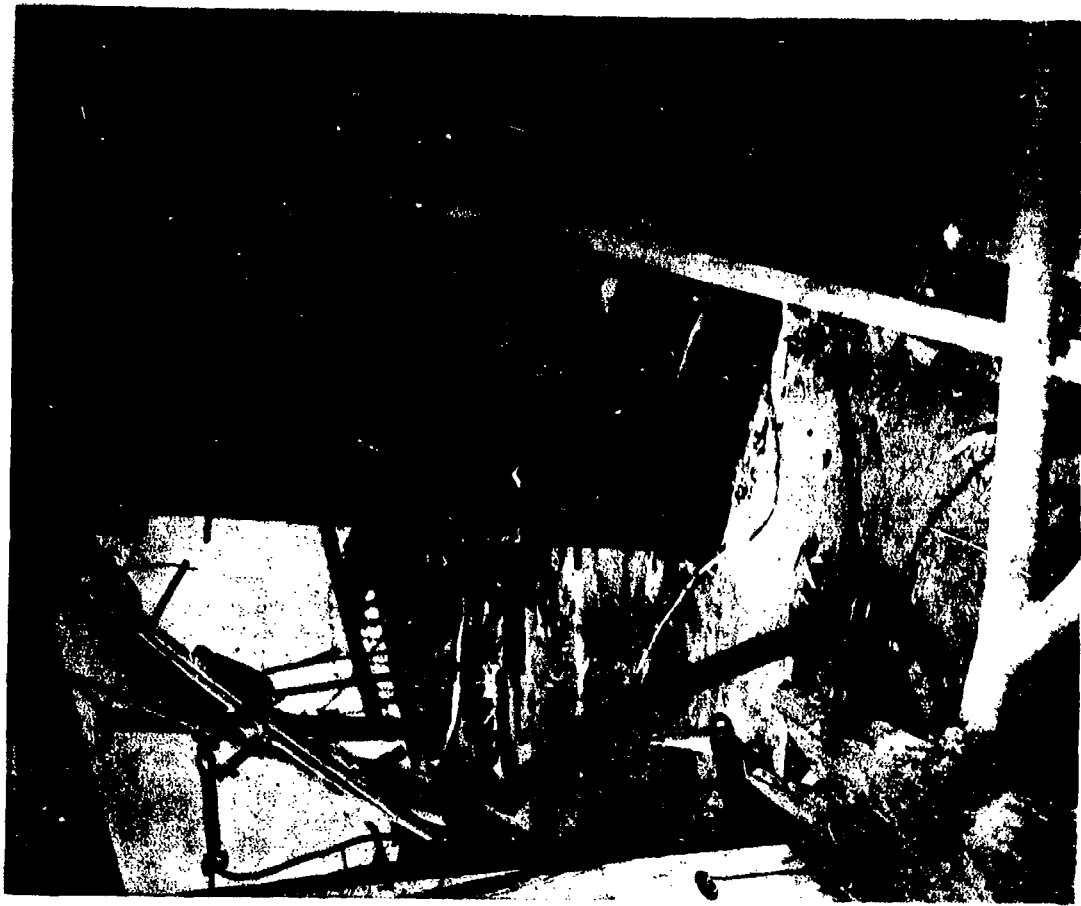


AA-CR-58-2008-8. Midship deckhouse after bulkhead, looking forward.

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AA-CR-88-2162-10. Starboard after corner of deckhouse looking forward. Note section of catwalk wireway.

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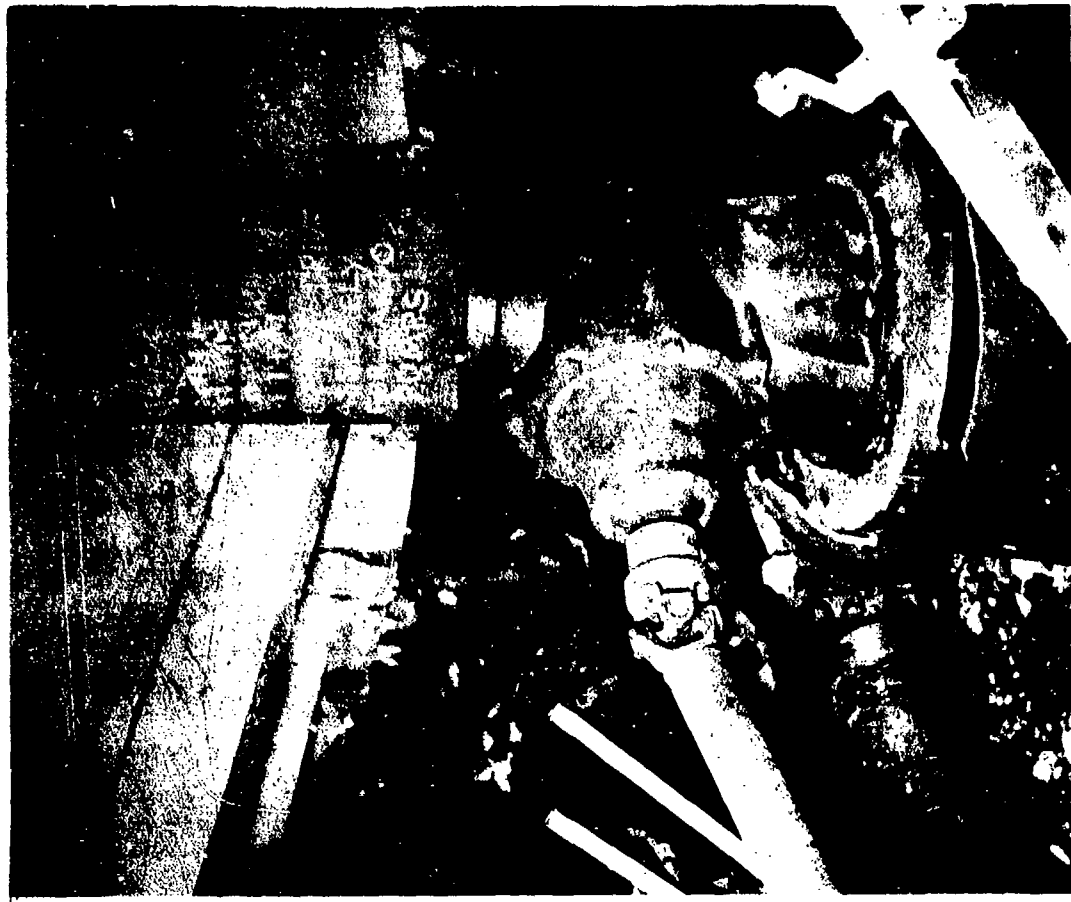


AA-CR-58-2008-4. Midship deckhouse, after starboard side.

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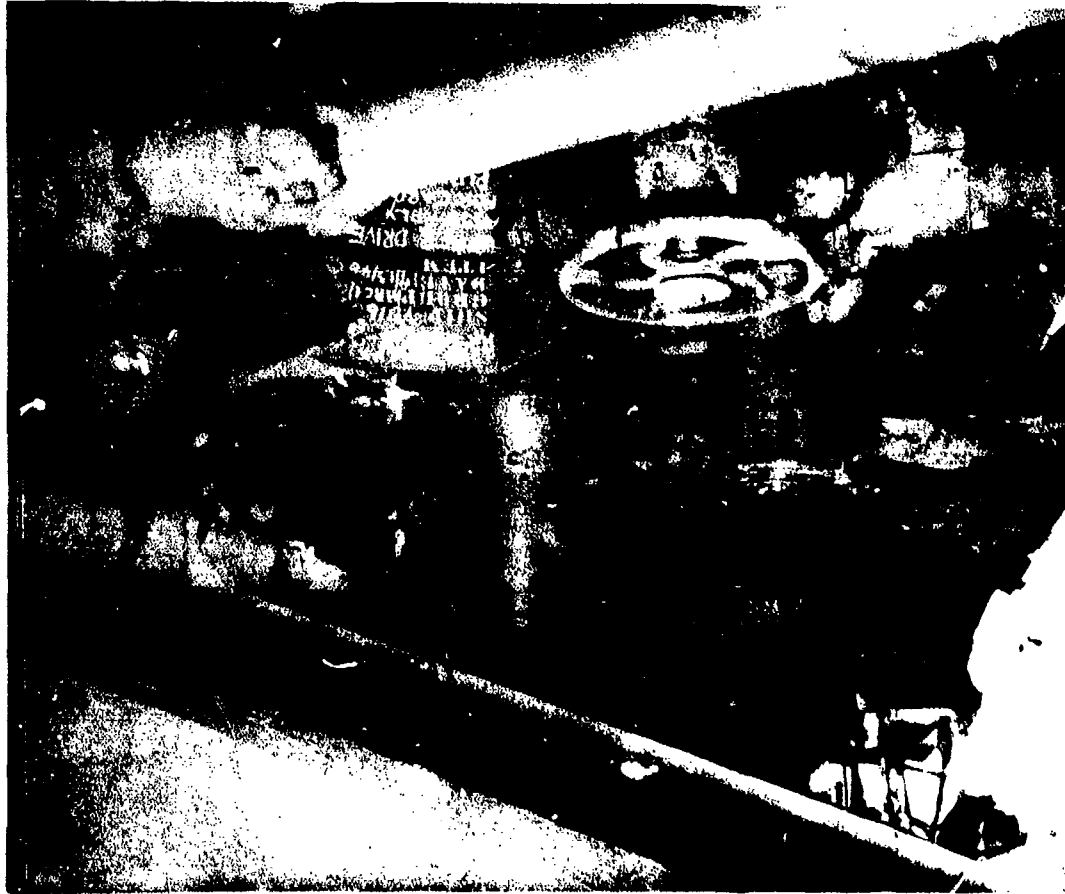


AA-CR-88-2161-1. Damage to upper drive assembly for cargo pumps and overhead structure of deck house amidship.

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AA-CR-88-2161-3. Damage to upper drive assembly for cargo pumps and overhead structure of deck house amidship.

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AA-CR-88-2162-3. Interior of deckhouse amidship showing damaged ballast pump motor and rubble from demolished overhead.

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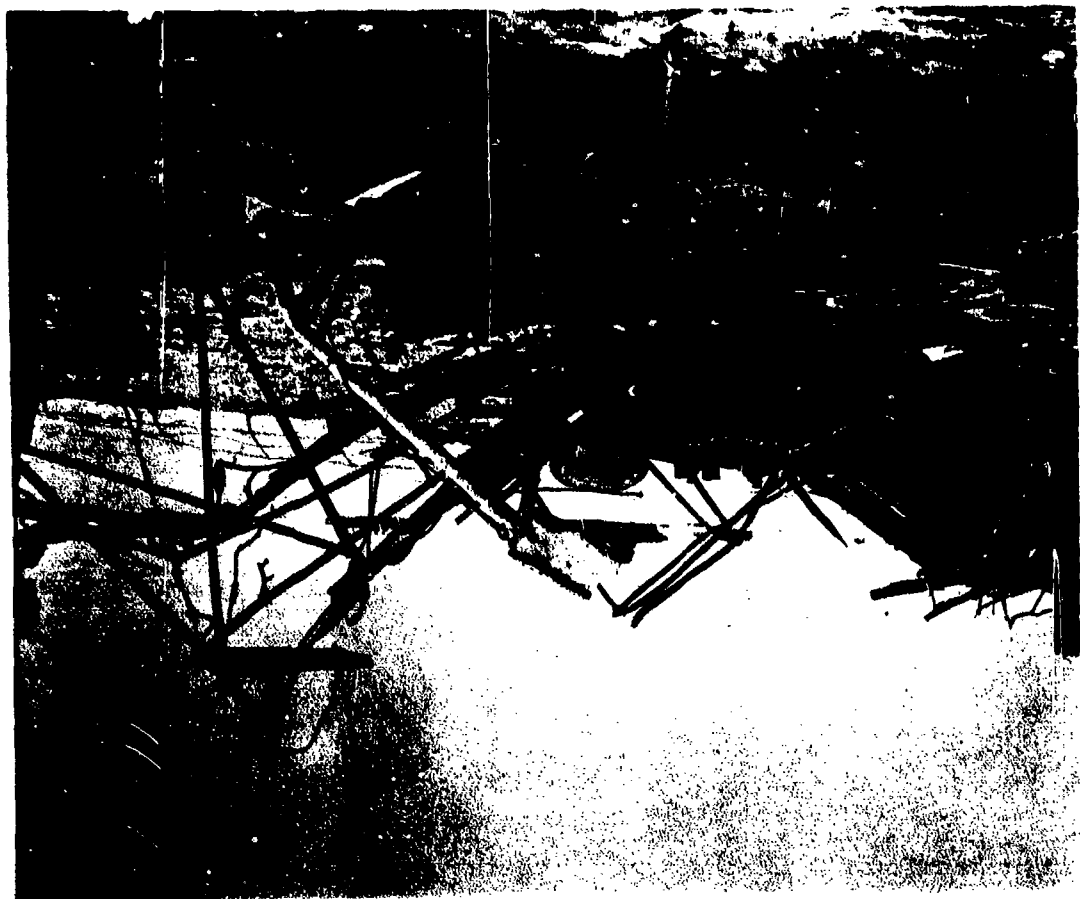


AA-CR-88-2162-4. Interior of deckhouse amidship showing damage to overhead bulkhead and ballast pump motor controller.

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AA-CR-58-2008-2. Damage to material on main deck, looking aft and to port from midships.

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AA-CR-58-2008-10. Deck damage looking aft from midship.

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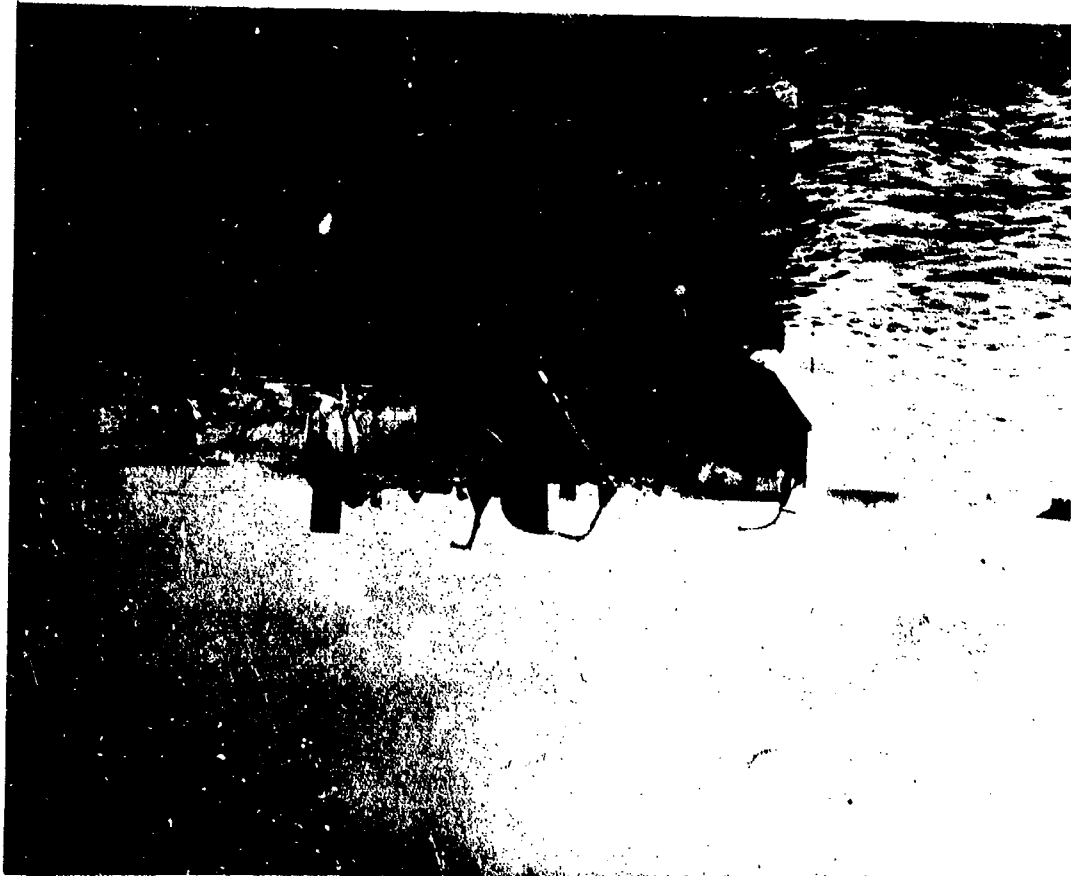


AA-CR-58-2007-11. View of port side aft after Test A.

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AA-CR-58-2007-3. View of starboard side aft after Test A.

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AA-CR-58-2009-1. Poop deck, looking aft.

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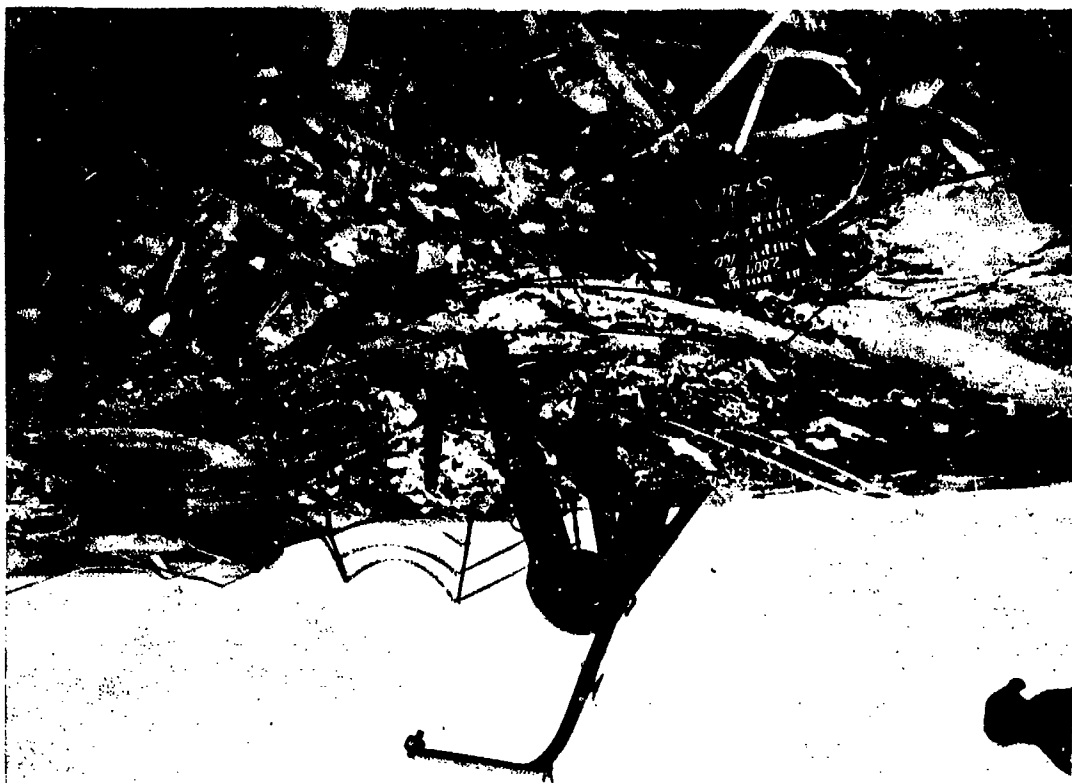
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AA-CR-58-2009-2. Poop deck, port side.

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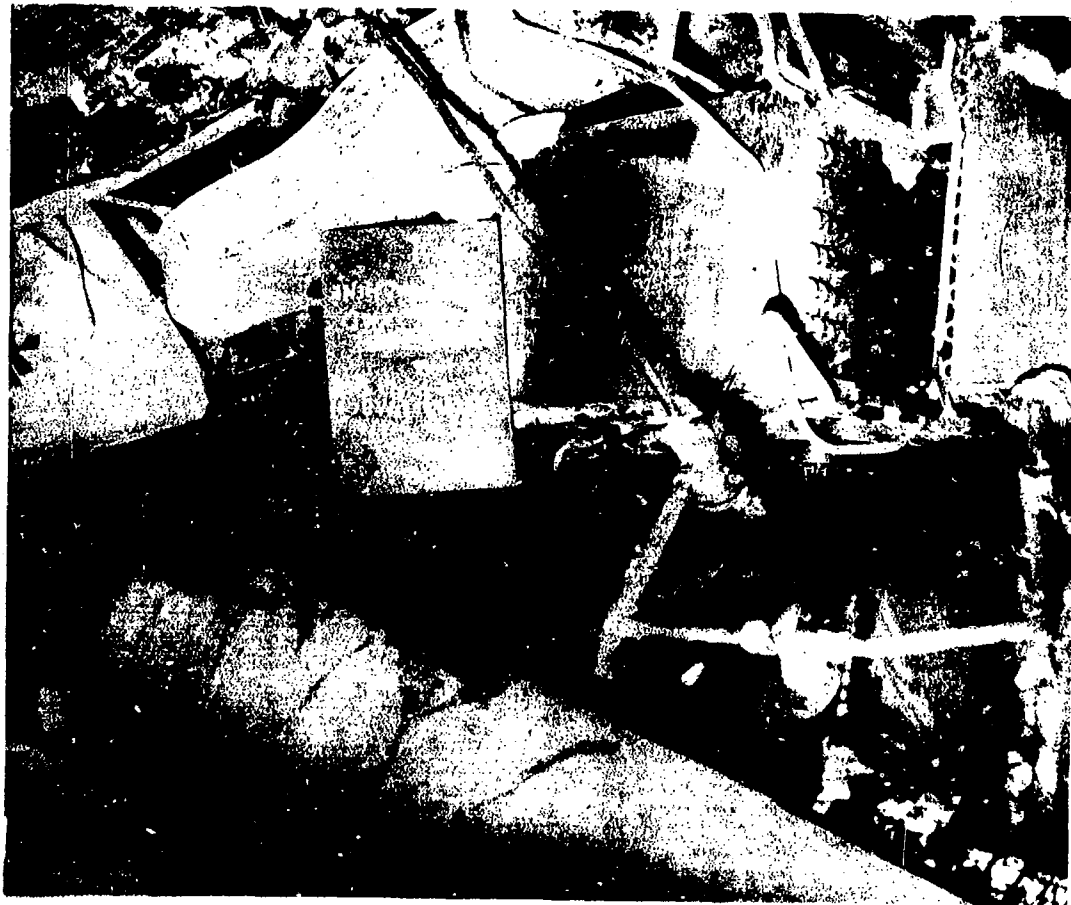
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AA-CR-58-2009-3. Poop deck, starboard side.

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AA-CR-88-2161-4. Damage to steering gear, ice machine and poop deck structure overhead.

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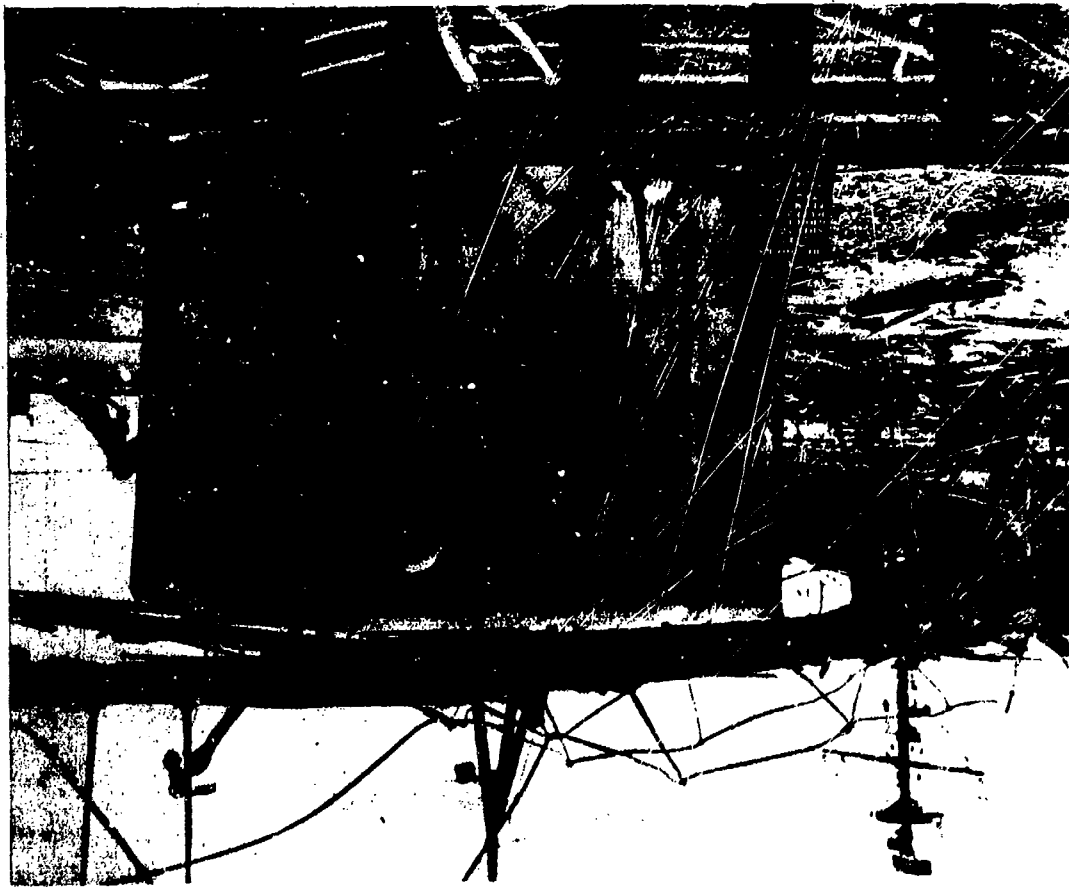
AA-CR-58-2007-4. View of starboard side amidships after Test A.

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AA-CR-58-2056-11. View from port quarter after Test A showing general condition of weather deck. List of the vessel is not incident to the test.

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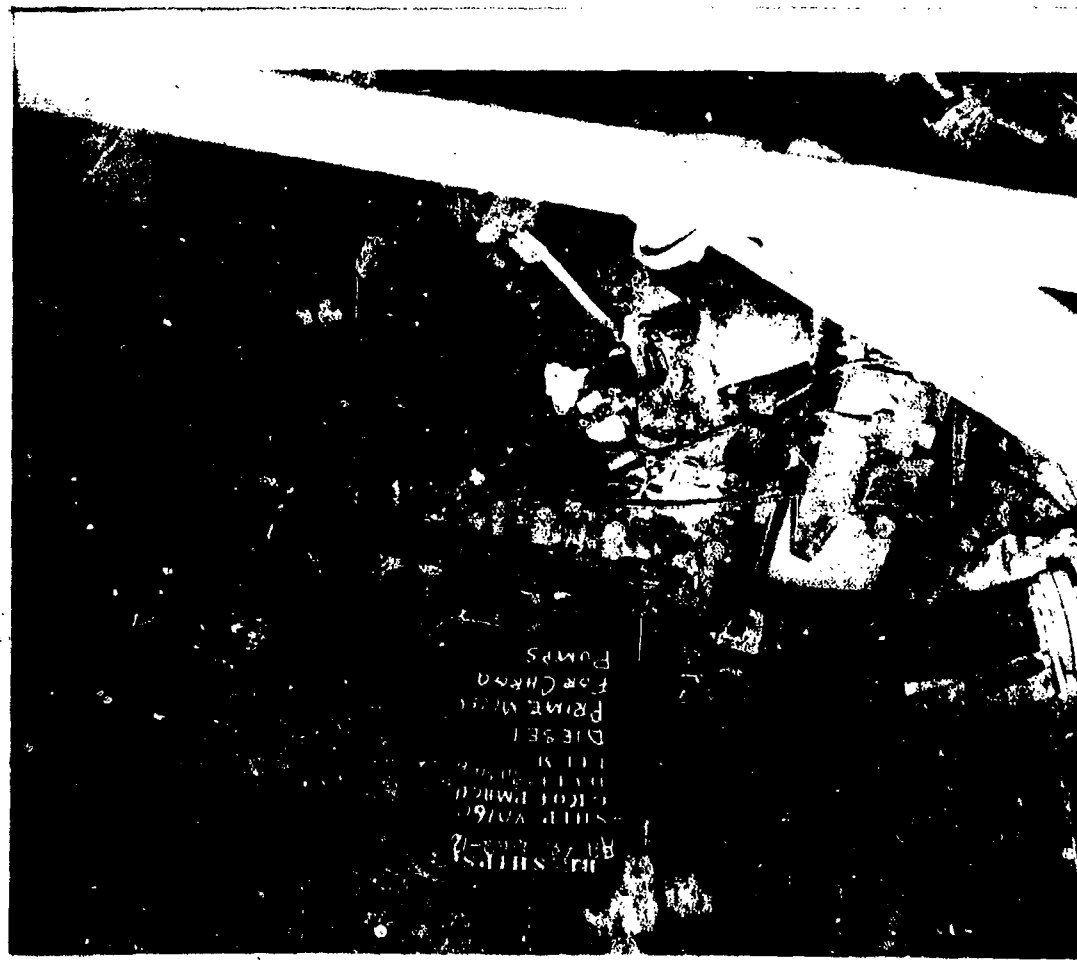


AA-CR-58-2056-12. Tank on main deck aft. Showing dishing of plating.

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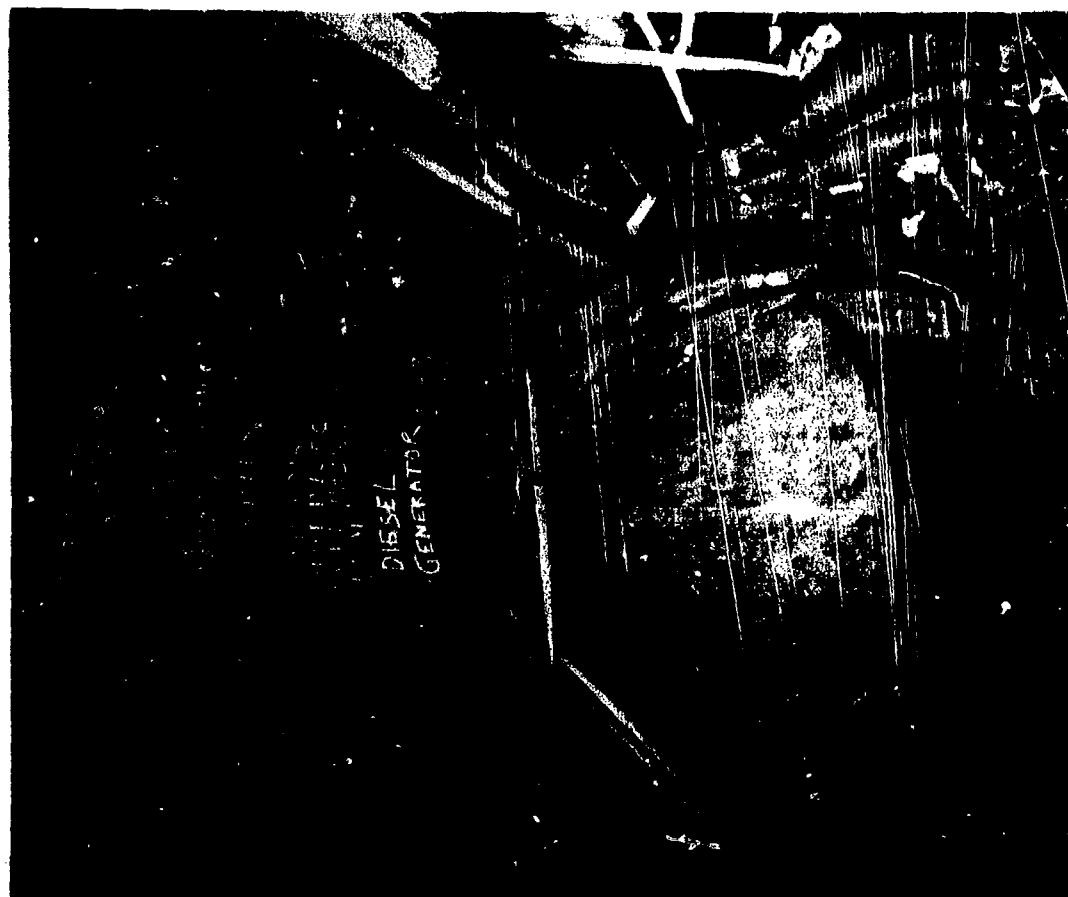
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AE-CR-88-2162-15. Diesel engine for cargo pumpin.

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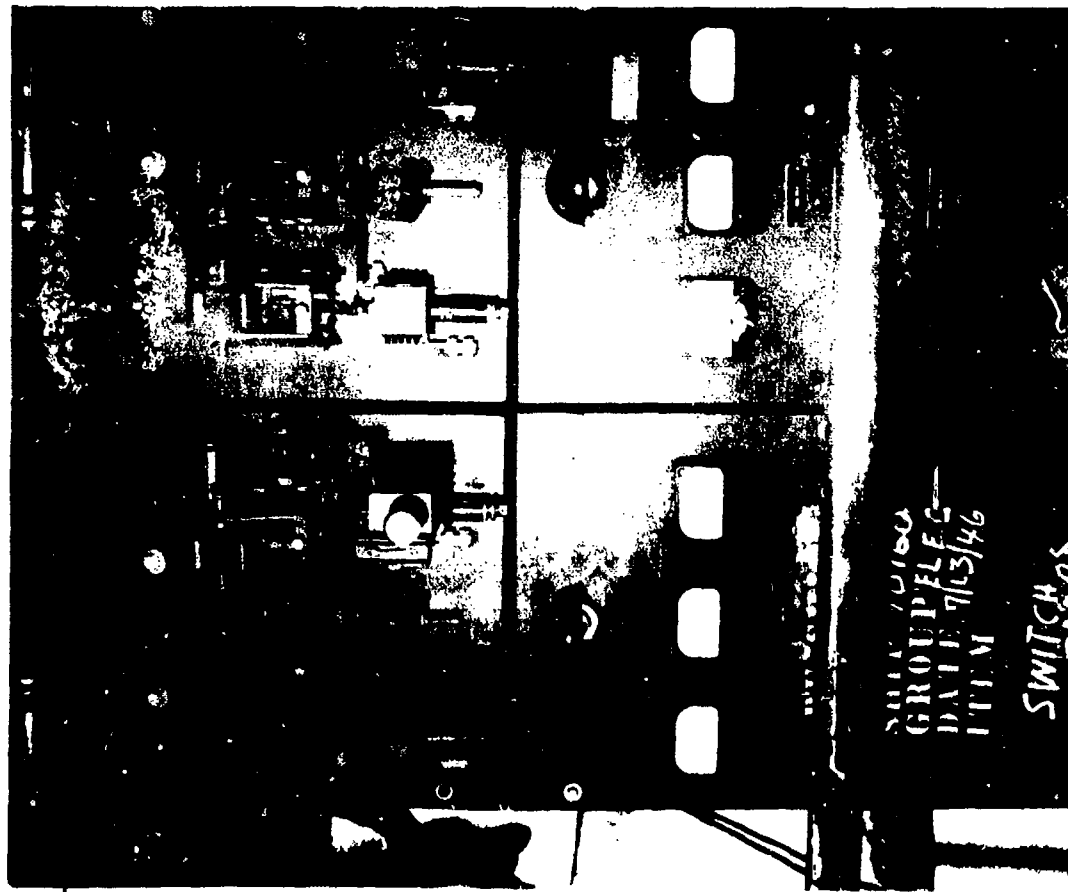
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AA-CR-68-2162-8. The main diesel generator located in the engine room.

## REFERENCES

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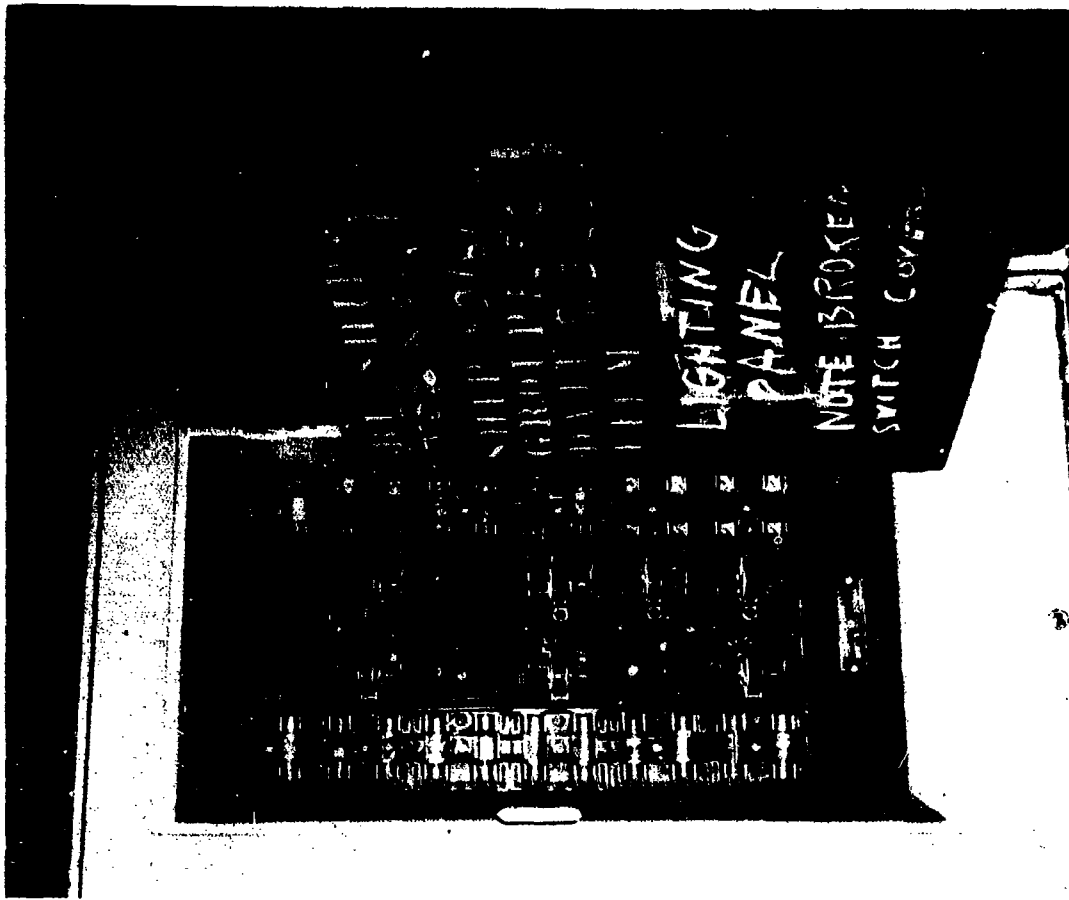


AA-CR-24-9785-6. Main engine control panel located in the engine room.

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AA-CR-88-2162-9. Lighting distribution panel located in the trunk leading to the superstructure aft.

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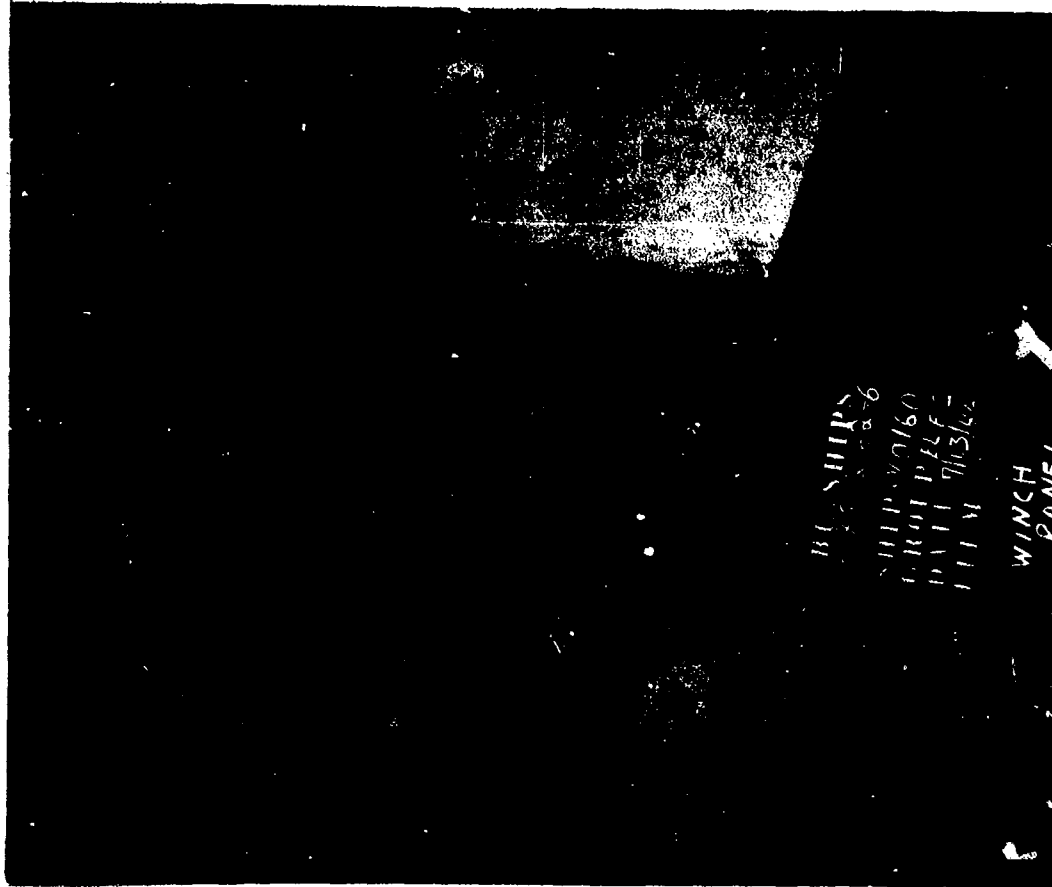
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AA-CR-88-2162-6. The winch contactor panel located in the engine room. Classification (Corrected) (Changed to Security Information) 18 APRIL 1949

87 Authority of JOINT CHIEFS OF STAFF JCS 1755756 DATED 16 APRIL 1949

SECRET 37 *John A. Kuylen* Date MAY 16 1952

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18 April 1997

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ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

|                           |                         |
|---------------------------|-------------------------|
| /✓AD-366588 <del>4</del>  | XRD-203-Section 12✓     |
| AD-366589 <del>4</del>    | XRD-200-Section 9       |
| AD-366590 <del>4</del>    | XRD-204-Section 13      |
| AD-366591 <del>4</del>    | XRD-183                 |
| /✓AD-366586 <del>4</del>  | XRD-201-Section 10✓     |
| /✓AD-367487 <del>4</del>  | XRD-131-Volume 2✓       |
| /✓AD-367516 <del>4</del>  | XRD- <del>13</del> 143✓ |
| /✓AD-367493 <del>4</del>  | XRD-142✓                |
| AD-801410L✓               | XRD-138✓                |
| AD-376831L✓               | XRD-83✓                 |
| AD-366759 <del>4</del>    | XRD-80                  |
| /✓AD-376830L <del>4</del> | XRD-79✓                 |
| /✓AD-376828L <del>4</del> | XRD-76✓                 |
| /✓AD-367464 <del>4</del>  | XRD-106✓                |
| AD-801404L✓               | XRD-105-Volume 1✓       |
| /✓AD-367459 <del>4</del>  | XRD-100✓                |

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18 April 1997

Subject: Declassification of Reports

AD-801406L ✓ XRD-114✓

In addition, all of the cited reports are now **approved for public release; distribution statement "A" now applies.**

*Arldith Jarrett*  
ARDITH JARRETT  
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